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MILITARY SURGERY IN WORLD WAR II*

A Backward Glance and a Forward Look

MICHAEL E. DEBAKEY, M.D.†

NEW ORLEANS, LOUISIANA

A DISTINGUISHED alumnus of Harvard University, Walter Lippmann, recently quoted what he identified only as the remark of a discouraged man: the lesson of history is that the lesson of history is never learned. Certainly, that statement holds for almost every phase of military surgery. We did not profit by the experience of World War I, much less that of previous wars, and in many respects it took us a discouragingly long time to comprehend the lessons that took form during World War II.

Perhaps the chief reason for our early difficulties in World War II is that we had not read the official British and American histories of World War I. Major General Philip Mitchiner, in 1944, confessed that sin of omission for the Royal Army Medical Corps, and it is open to question whether some American medical officers even now know that the histories exist. A partial explanation may be that the American history was published too long after the war had ended. By the time the first volume appeared, American physicians had dismissed from their minds most of the recollections of World War I, and in 1929, when the last volume appeared, a second world war still seemed inconceivable.

Trench foot, which is a responsibility of Command quite as much as of the Medical Corps, is an excellent illustration of a lesson that we should have learned and did not. In the spring of 1943 the campaign in the Aleutians produced several hundred cases of what was termed "immersion foot." In the following winter there were several thousand cases of what was unmistakably trench foot among the Fifth Army components fighting on the Italian Front. In the winter of 1944–1945 there were some 50,000 cases among the American forces fighting on the Western Front, the first concentrations of cases occurring during the critical days of the Battle of the Ardennes Bulge. The great majority of those cases, it is fair to say, should never have occurred. Larrey, Napoleon's surgeon, had written a classic description of the condition, which contained many a useful warning, well over a century before. Trench foot, under other names, was reported in the Crimean, the Russo-Japanese and the Balkan wars. The British armies in Flanders and on the Somme had learned about it the hard way in World War I and had remembered the lesson through the years; trench foot was no problem among the British troops in World War II. We ourselves had had the experience in the Aleutians to prepare us for Italy, and that in Italy to prepare us for the Western Front. In fact, in the summer of 1944 the débacle of the coming winter on that front was clearly prophesied by the Surgeon General's Office. It is small consolation to reflect that had the Pacific War required the invasion of Japan and Manchuria, where the conditions of winter fighting in Europe would have been duplicated, the incidence of trench foot would probably have been minimal, for prophylaxis had been most carefully planned on both Command and Medical Corps levels.

Other illustrations can be mentioned only briefly. If, for instance, we had read of or had remembered the many and futile attempts in World War I to sterilize wounds by means of antiseptics, we should have known better than to put our faith in any extraneous substances, including the sulfonamides, on which we leaned so heavily in the early days of World War II. If we had read nothing more than the report of the Inter-Allied Surgical Conference in Paris in 1917, we should have known and could have put into immediate practice all the essential principles in the management of war wounds that were finally learned after many months of costly experience in World War II.

Medicomilitary lessons, like strictly professional lessons, were also learned the hard way. The possibilities of body armor, for example, were discussed in considerable detail in the history of the American Medical Department in World War I. Protective devices were adopted in World War II by the Air Force, with considerable savings in deaths and

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wounds, by the end of 1943. On the basis of this experience, small though it was, and of several intensive studies on the lethality of weapons, it should have been apparent that great benefits might be derived from further developments in this field. Available statistics suggested that their adoption might reasonably be expected to reduce the number of men killed in action by 12 per cent and of those

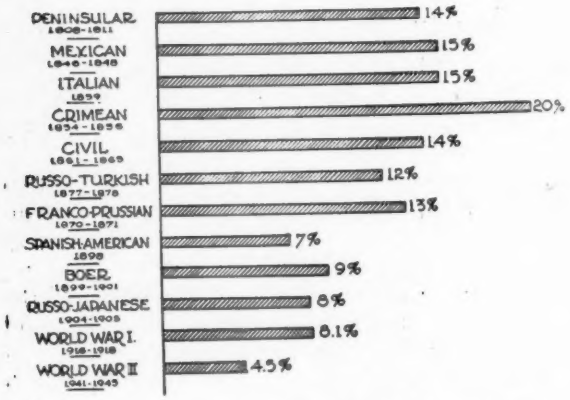

FIGURE 1. *Mortality of Wounded in Various Wars.*

wounded in action by 8 per cent, but the Pacific War ended before body armor was in use on any front.

Convalescent camps, which were authorized for each hospital group in May, 1918, formed no part of the original planning for World War II and were provided, as in World War I, only after experience had shown that they were needed. Field hospitals for major surgical procedures were not planned in World War I for nontransportable patients who required prompt life-saving surgery, but were developed when the need became evident. It is ironic that in World War II the same evolution was necessary, although little reflection seems needed to make it plain that many of the injuries responsible for the greatest loss of life must be treated at this level if salvage is to be accomplished. At the end of the war, the field hospital still did not have tables of organization and equipment and, in the minds of administrative personnel, was still not fully accepted for the purposes it was serving, although it was the only available unit that could have been modified and made sufficiently flexible to meet them.

Whether a valid appraisal of the surgery in World War II is possible at this time is seriously doubtful. In the first place, we are still much too close to what has happened to permit comments that would be entirely objective; too many considerations, many of which have nothing to do with medicine, are likely to color our thinking, and under the circumstances overenthusiasm would be quite as much an obstacle to objectivity as prejudice or indifference. In the second place, a much longer time will be required to analyze all the medical data statistically and qualitatively. Representative samples, however, permit definitive conclusions and make clear the salvage that occurred in World War II, both absolutely and as compared with that in previous wars, in spite of our failure to learn the lessons of those wars.

From the Peninsular War, which began in 1808, through World War I, a period of more than a century, the proportion of men dying of battle wounds was almost halved (Fig. 1). In World War II, which occurred only twenty-five years later, the proportion of men dying of battle wounds was again almost halved, although the number of wounded exceeded those in any previous war so recorded that estimates are possible. The absolute magnitude of these gains is not in any way invalidated by the unhappy realization that had we learned our lessons earlier, the salvage might have been still greater.

The case fatality rates of World War II, when examined from the standpoint of regional injuries, were from 25 to 50 per cent lower than those of World War I, which themselves showed a considerable reduction over comparable rates in the Civil War (Fig. 2). For the sites that were potentially the most fatal — that is, the head, chest and

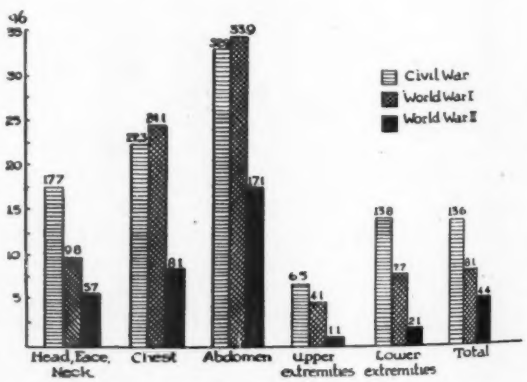

FIGURE 2. *Mortality in Various Wars according to Location of Wound.*

abdomen — the rates in World War II were a half to two thirds below those in World War I.

Finally, to examine the gross statistics from still another standpoint, had the death rates after wounding that obtained in World War I been duplicated, almost 22,000 more deaths would probably have occurred in World War II (Fig. 3). This is a total salvage of 45 per cent, and on a relative basis the calculated savings equal or exceed 35 per cent for every region of the body. Although comparable

figures are not available, I am convinced that the salvage in morbidity was even greater.

The Background of Military Surgery

Before discussion of how these improvements were brought about in World War II, it is well to consider the background against which military surgery must be done. The surgery of a modern war has been aptly defined as the surgery of trauma in epidemic proportions. The demand is so enormous that it can be met only by a closely co-ordinated, well integrated medical organization prepared to operate promptly, efficiently and simultaneously under widely varying conditions and in all parts of the world. The organization must be highly mobile, so that it can move with the battle; otherwise it will lose its usefulness. It must function without interfering with the battle; the first objective is to get on with the fighting, and to fail in it or to impede it would not be to the best interests of the wounded, either individually or en masse.

The medical organization must operate long lines of evacuation from the front, where injury occurs and first-aid measures are carried out, to the rear, where definitive treatment is given, and thence to the homeland, where final therapeutic measures are applied. At the same time it must be prepared to treat well toward the front lines both men who are so lightly wounded that they can be promptly returned to duty and those who are so seriously wounded that they cannot be moved farther without treatment, or who require without delay operations of such a character as to prohibit transport immediately afterward. The whole process of evacuation, in fact, must be conducted on the basis of the transportability of the patient, which is itself predicated on the character of the injury, the physiologic reaction of the patient and the therapeutic measures employed.

All the circumstances of war surgery thus do violence to civilian concepts of traumatic surgery. The equality of organizational and professional management is the first basic difference. The second is the time lag introduced by the military necessity of evacuation. The third is the necessity for constant movement of the wounded man, and the fourth — treatment by a number of different surgeons at different places instead of by a single surgeon in one place — is inherent in the third. These are all undesirable factors, and on the surface they seem to militate against good surgical care. Indeed, when the over-all circumstances of warfare are added to them, they appear to make ideal surgical treatment impossible. Yet this was not true in the war we have just finished fighting, nor need it ever be true. Short cuts and measures of expediency are frequently necessary in military surgery, but compromises with surgical adequacy are not.

A number of factors, some inherent in the military circumstances and others created by proper concepts and derivative planning, overcame the obstacles to ideal surgery in World War II. The first of these was what might be termed the standardized pattern of trauma and of physiologic response to it. Most of the diagnostic confusions of civilian medicine do not exist in military surgery, although, naturally, I do not mean to imply that serious diagnostic problems are not involved. On the other hand, whether a wound is in the extremities or in the abdomen or chest, or is caused by a high explosive, a land mine or a jeep, the pattern assumes the same general characteristics; the physiologic response, whether actual or potential, can be assumed to be similar, and the therapy required, resuscitative as well as

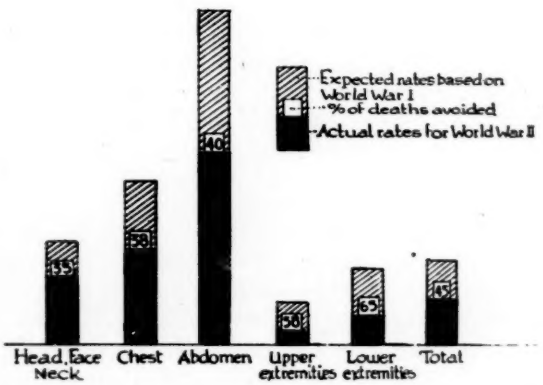

FIGURE 3. *Percentage of Expected Deaths (Based on World War I Mortality Rates) Avoided in World War II.*

surgical, follows the same general lines. Furthermore, the United States Army consisted on the whole of a selected group of men, in the best years of their lives, in whom physical defects and chronic and degenerative diseases had been excluded by preliminary screening.

At least two planned factors also compensated for the unfavorable background of military surgery. The first was the principle of standardization or, as some might choose to term it, of regimentation. The framework into which the wounded man and the medical officer were alike required to fit was frankly rigid. But within the framework individual initiative was both permitted and encouraged, the ability and skill of the experienced surgeon were stimulated, and the less experienced surgeon was provided with training and guidance. As always, a general uniformity of technical procedure was regarded as essential, for reasons of safety, simplification and expedition, to make mass instruction of the medical personnel feasible and to permit standardization of basic equipment. I might interpolate that the directives and other means by which information and advice were disseminated were based on actual experience and represented the composite, carefully

arrived at conclusions of many surgeons rather than the whims and practices of a single surgeon or one group of surgeons.

A second compensatory factor was the precise definition of the function of each echelon in the chain of evacuation, from the first aid given on the battlefield by medical corpsmen to the reparative surgery performed in the general hospital at the base. Each procedure was timed and graded in relation to the whole picture, including the tactical situation, the particular point in the chain of evacuation and the wounded man's own status. Hospitals were designed and equipped for surgery of varying degrees of urgency and magnitude, with due consideration of the necessary duration and other requirements of postoperative care, and were strategically placed with reference to those considerations. Professional personnel were distributed in accordance with the function of the installation and the type of surgery to be performed. It is to the credit of a profession of individualists that almost every man submitted to these medicomilitary disciplines, recognized their necessity and justice, and confined himself to the job he was assigned to do where, when and as he was directed to do it.

Regimentation was based on fundamentally sound principles. The directives provided, for instance, that except for maxillofacial and cranial injuries, all wounds must be left unsutured after débridement, that all amputation stumps must be left unsutured, that transportation casts must be split or bivalved as soon as the plaster was dry and that injuries of the large bowel must be treated by exteriorization. Undoubtedly the transgression of any of these directives would have been practical and safe in numerous selected cases, but not much reflection is needed to make clear the folly of permitting the privilege of selection under combat conditions to thousands of surgeons who had been trained under varying schools of surgical thought and who were of varying degrees of ability and experience.

It was also necessary to view certain elective procedures in the cold light of military realism. What is good practice in civilian surgery is not necessarily the best practice, or even good practice, in military surgery. It was estimated, for example, that over a two-year period, 425,000 hospital days (approximately 1192 man years) were saved, and a corresponding amount of manpower time was made available, by the limitation of the treatment of pilonidal cyst and sinus to simple incision and drainage, or by the withholding of surgery altogether. Likewise, large savings were made and a great many difficulties circumvented by the adoption of conservative policies in the management of hydrocele, internal derangements of the knee and herniated nucleus pulposus.

Perhaps the most striking illustration of the necessity of detailed planning and of the value of uniformity of organization is supplied by the processing of injured men on their return to the Zone of the Interior. For a period of some six months casualties from overseas were received at the ports at the rate of about 1000 a day. For a few months they numbered almost 2000 a day, and a large ship, such as the *Queen Mary*, might transport as many as 3000 at a time. Yet day after day, within an average of seventy-two hours of their arrival, most of the injured men were on their way by train or plane to the general hospitals selected as appropriate for them after assessment of their specialized needs at receiving hospitals on the coasts, procurement of authorized bed space from Washington and as much consideration as possible of the proximity to their homes of the hospitals to which they were sent. A triage of such monumental proportions would have been a remarkable achievement no matter how it was accomplished. That it was carried out with minimal errors in assignment and with no accidents of any consequence is as much a tribute to the planning of this special operation as it is clear-cut proof of the necessity for standardization of procedure.

The competent performance of the surgical personnel who participated in World War II undoubtedly had more to do with the surgical results achieved than any other single factor. That performance was made possible, in turn, by the increased availability of such personnel, in comparison with World War I, and by proper assignment.

The principles of specialization, as the term is understood today, had scarcely developed when the United States entered World War I. The Surgeon General, however, showed his awareness of the trend and took official cognizance of it by the appointment of a civilian specialist to advise him concerning surgery and the surgical specialties. This officer, who entered the Army with the rank of major and who served only part time, was responsible for the later selection of an advisory board, quite loosely organized and appointed on a geographic as well as a professional basis. At the same time, consultants in major specialties and subspecialties were appointed to overseas hospitals and units.

Although these concepts represented a real advance in military surgery, the theory of specialization was never fully translated into practice during World War I. The original development was undirected and unwieldy, and for a time the basic specialties of medicine and surgery were almost submerged by the independent mushroom growth of the subspecialties. Furthermore, the criteria of classification of specialists were elementary — they could hardly have been otherwise, for the modern system of residencies was practically unknown and the first of the qualifying boards did not come into existence until 1916. As a result, the applicant for a commission was graded chiefly on the basis of his personal statement of his qualifications and training, which, as might have been anticipated, sometimes bore little resemblance

to the realities. At the end of World War I specialized military practice ceased to exist with the rapid demobilization of the Medical Corps and, for all practical purposes, remained nonexistent during the interval between the wars.

Many of the difficulties that attended the effective utilization of specialists in World War I were avoided in World War II. Within three months of our entrance into the war there was established in the Office of the Surgeon General a Professional Consultants Division of full-time officers, with ranks eventually appropriate to their duties, although the administrative authority with which they were endowed was never fully adequate for their responsibilities. I need not repeat that the Surgical Consultants Division was headed by Brigadier General Fred W. Rankin, but I do want to pause to pay tribute to the native ability, the trained competence, the hard common sense and the uncompromising and unswerving honesty of purpose with which he carried out his duties, with the single-minded objective of providing for American soldiers the best surgical care any army has ever had.

As the war progressed, consultants in the major specialties, and usually in the subspecialties, were eventually appointed in every service command in the Zone of the Interior and in the Mediterranean and European theaters. The system, most regrettably, was never fully implemented in the Pacific, partly because of shortages of personnel and partly because of the deliberate postponement of the major effort in that area until the conclusion of the war in Europe. These consultants were selected with the utmost care, on the basis of training, ability, accomplishments and professional eminence, as a Boston audience need not be reminded, since the chief consultant for the Mediterranean Theater was Colonel Edward D. Churchill and the chief consultant for the European Theater was Brigadier General Elliott C. Cutler. From the medical standpoint, these were the important theaters, and Colonel Churchill and General Cutler exemplified to the highest degree the value of the consultant system and the possibilities of accomplishment within it.

The function of the surgical consultants was rather loosely defined as the promotion of the highest standards of medical practice within their areas of responsibility. They fulfilled it not primarily by the development of policies, but by the effective utilization and the continuing assessment and reassessment of specialized surgical personnel. When qualified personnel were properly assigned, policies developed of themselves. These surgeons were well trained men, many of them with long experience in civil life. Their concepts of surgery were correct. They were thoughtful as well as technically able. Their minds were open, and they realized the importance of changing their original convictions in the light of altering developments and cumulative experience. They were widely distributed and traveled widely, so that their influence spread in ever-widening circles. It is no paradox to say that although most of them did no surgery and treated no patients in the course of the whole war, they were responsible for incalculable savings of life and limb.

Surgical Advances in World War II

No major revolutionary changes in surgical practice were introduced during World War II. On the other hand, because of the enormous, concentrated surgical experience, principles were rapidly established — and are now being applied in civilian practice — that in the ordinary course of events would have taken years to establish. Furthermore, as the war progressed, there was an extraordinary appreciation, as well as a remarkably intelligent application, of fundamental principles so adapted as to meet the exigencies of military surgery. We were slow to learn some lessons and slow, perhaps, to utilize our experiences, but eventually certain concepts in the various fields of surgical endeavor became more clearly defined and their technical application became more general, with progressive improvement in mortality and morbidity rates.

The major advance, which underlay the progressive improvement in results accomplished as the war progressed, was the concept of phased wound management developed by Colonel Churchill in the early days of the Mediterranean fighting. This principle recognized the factors in the military environment that precluded ideal surgical practice and compensated for them by a rational timing of surgical measures to conform, in general, with the tactical necessities of the military situation. Its three phases were as follows: initial wound surgery, a function of advanced hospitals in the Army area, which was concerned with surgical procedures designed to save life and prevent or eradicate wound infection; reparative surgery, a responsibility of general hospitals in the Zone of Communications, which was concerned with procedures designed to shorten the period of wound healing, restore early function and minimize ultimate disability; and reconstructive surgery, a function of general hospitals in the Zone of the Interior, which was concerned with the correction of deformities and with rehabilitation in general.

The first and second phases of this plan took advantage of established principles of wound healing. From a military standpoint the entire concept was based on the fact that shortly after the first phase most patients, except those with penetrating wounds of the chest and abdomen, are safely transportable, whereas immediately after the second phase they become nontransportable for periods varying from a few weeks in cases of soft-part wound to several weeks in cases of fracture. By proper co-ordination of the three phases of this plan in time and space,

a close approach — perhaps the closest approach possible — to ideal methods of wound management was achieved within the limits of a military setting.

It proved possible to apply this principle of phased surgery to virtually every type of wound. Colonel Churchill himself admirably explained its application to thoracic surgery in World War II, in which, as he noted, the lung rather than the pleural space had become the focus of medical attention. In this type of surgery, he continued, two phases had to be recognized: physiologic disturbances and infection. The former required immediate correction in the most forward installation possible, sometimes by surgical measures; infection could occasionally be eliminated at the same time, but only incidentally. In general, the proper time to manage infection was within three days to six weeks after injury, and the place to correct it was an installation to the rear.

The phased management of abdominal injuries involving the large bowel required, in oversimplified terms, exteriorization of the injured segment in a forward installation, with subsequent closure of the colostomy in an installation in the rear. The phased management of fracture implied débridement of the wound and immobilization for transportation purposes in a forward installation, with later precise reduction and wound closure in a rear installation. Peripheral-nerve injuries, according to this principle, were débrided at initial surgery and sutured within an optimum period after delayed wound closure either overseas or in the Zone of the Interior, usually depending on the availability of transportation. Head and spinal-cord injuries and all other types were managed by similar temporal and spatial concepts.

Even the concept of resuscitation — ably developed in the Mediterranean Theater by Colonel Henry K. Beecher and based on a newer knowledge, largely provided by him and his associates — was phased, its objective being to present to the surgeon a patient who would be as favorable an operative risk as possible. Time does not permit a discussion of the important role played by this group of physicians in the delineation of the respective places of plasma and whole blood in resuscitation, in their bringing us back to sanity in the use of morphine (for which, they showed, a cigarette is sometimes an excellent substitute) and in anesthetic methods in wartime, a consideration of which would be peculiarly appropriate at this time and place.

A matter that statistics do not show and that deserves far more than the passing comment possible is the new approach to rehabilitation and reconstruction characteristic of surgery in World War II. Maxillofacial surgery achieved apparently impossible results, as did surgery of the hand. Programs of rehabilitation were designed for deaf and blind patients and for those who had lost limbs. The paraplegic program was not only a medical triumph and a shining illustration of the humanity with which the science of surgery can be practiced but also a brilliant example of how co-operative medicine should be practiced.

Research Activities in World War II

The research activities of World War II, brilliant as many of them were, furnish another excellent example of the lessons that we failed to learn from World War I. Important advances were made in various fields, but they were made late, after many hesitations and false starts, and in retrospect, it is easy to see how many opportunities were lost.

Significant information was obtained in World War I by research studies in overseas theaters concerning shock and hemorrhage, and by similar studies in this country regarding empyema. The data thus obtained were of great value in furthering knowledge of these subjects. Yet in spite of that experience, the policy in the early days of American participation in World War II discouraged clinical investigations in Army hospitals, research problems being referred to the National Research Council for investigation by civilian workers. The barrier thus set up was never completely crossed and was the chief reason for the delays and other inadequacies that attended the research problem throughout most of the war.

As the war progressed, the original policy discouraging research in Army installations was necessarily modified, and studies on special problems by small groups of investigators in the field proved feasible and valuable. Some of the studies carried out by members of the staff of the Massachusetts General Hospital and of the faculty of Harvard University provided information of the greatest value concerning the physiologic responses to shock, the bacteriology of wounds, the indications for transfusion in war surgery and, as mentioned above, the respective areas of usefulness of plasma and whole blood.

Isolated studies by individuals also frequently proved valuable, but many of them were invalidated by the lack of scientifically planned controls, and most represented an unnecessary waste of time, effort and personnel. During the war the Army Epidemiological Board had repeatedly shown what could be achieved by an organization prepared to function as soon as and wherever the necessity arose, and that board — and this is significant — functioned directly under the Secretary of War, with all the prestige and advantages of his authorization. It was not until August, 1945, when the great need and the great opportunity alike ceased to exist, that the Army Medical Research Board, with proper clinical representation, was finally set up in the Surgeon General's Office.

So much for the Army side of research during the war. Parallel, but seldom co-ordinated or integrated with it, was the effort of the Division of Medical Sciences of the National Research Council. Its

valuable work, to which I am glad to pay my own personal tribute, is undoubtedly familiar to all. Nonetheless, from the standpoint of military surgery, it never completely succeeded in accomplishing its objectives, because of the barrier between military surgeons and civilian investigators that was never completely crossed on either side. Liaison existed between the Army and the various subcommittees of the National Research Council, it is true. Data from the field were supplied to the civilian investigators within the limits permitted by security regulations. Security regulations, unfortunately, were too often interpreted and applied with extreme severity, and medical documents that would have been of the greatest usefulness to research workers were classified far beyond the limits required by military security. Reports were made to appropriate subcommittees by occasional surgeons returned from overseas, and an occasional observer from the Council made surveys in the field. But complete integration of ideas and purposes was almost never achieved — not through any fault of personnel or through any lack of desire, but because of the initial setup. The failure was fundamentally due to the artificial and fallacious concept that a military problem could be detached from its military background, solved as an abstract problem in a civilian laboratory by civilian investigators who had no contact with it at its point of origin, and handed back to the military surgeons, completely solved and accompanied by appropriate therapeutic recommendations. Working in their own airtight compartments, civilian investigators naturally could not develop a true concept of the background of military surgery, which differs in many respects, as emphasized above, from civilian surgery. Nor could they ever fully understand the special necessities of military surgery or its special urgencies. It is extremely significant, and indicative of their medical competence, that the civilian investigators themselves realized these handicaps. In its final report in September, 1944, the Subcommittee on Surgical Infections and Burns recommended that thereafter such projects be carried out by qualified groups in the Services and that future civilian projects be limited to laboratory and other studies that could not be conveniently carried out in military hospitals.

The slow development of an optimum method for the treatment of burns is an illustration of the lack of integration of research studies and military surgery. Authoritative pronouncements were badly needed. In 1939, at the beginning of the war, tannic acid was the most widely used of all local agents. It was not satisfactory, but no other of the multiple methods then in use was considered any better. In October, 1942, the Subcommittee on Burns of the Division of Medical Sciences of the National Research Council, in response to a communication from the Surgeon General, recommended that the Army postpone further purchases of tannic acid until additional information could be obtained. During the following month, in spite of a statement by the chairman early in the discussion that tannic acid jelly should not be used for either first-aid or definitive therapy, the tanning (eschar) treatment was recommended by the subcommittee for certain rather large categories of burns, and it was not until July, 1943, that the discontinuance of all escharotics was recommended and the substitute recommendation was made that first-aid measures consist only of the application of an oily, nonadherent agent, such as petrolatum.

By the time this conclusion was reached, the Surgical Consultants Division, on the basis of clinical experience in the North African Theater of Operations, which had clearly proved the ineffectiveness and actual danger of the eschar treatment, already had in preparation and on its slow way through channels a circular letter forbidding the use of any tanning agents and recommending simple pressure dressings, whose effectiveness had first been mass tested in the Cocoanut Grove fire in November, 1942.

The evolution of recommendations concerning the use of chemotherapeutic agents was similarly slow. In July, 1940, the Subcommittee on Surgical Infections, in collaboration with the Committee on Therapeutics and Other Agents, had recommended the oral prophylactic administration of some sulfonamide drug as soon as possible after injury, as a means of preventing infection. It was reluctant to advise the local use of these drugs because, in spite of lay and professional enthusiasm for the practice, no adequate data were available to justify such treatment. Eventually, however, in response to an urgent request from the Surgeons General of the Army and Navy for a ruling, local chemotherapy was recommended. As a result of these recommendations, the individual first-aid kit was provided with sulfonamide tablets for oral use and with dusting powder for use in wounds.

When funds became available to the National Research Council, controlled studies were instigated under its auspices and were carried out by competent investigators in civilian hospitals in more than 2000 cases of traumatic wounds. The conclusion was reached, after the first 1000 cases had been analyzed, that when predisposing factors exist for the development of infection in accidental wounds, the use of chemotherapeutic agents in any combination and by any route does not prevent its development, although systemic therapy is probably of value in preventing invasive sepsis. In its final report, in September, 1944, this conclusion was retained, but the subcommittee declined, because of the differing conditions in civilian casualties and battle casualties, to institute comparisons, nor would it make any recommendations for the use or the omission of bacteriostatic drugs as prophylactic agents in the prevention of local infection in war wounds.

The reports from Pearl Harbor seemed to indicate that both local and systemic chemotherapy was highly effective in battle wounds. Undoubtedly much of the early reliance on chemotherapy was due to that experience. In the enthusiasm over the results, however, many Army and Navy surgeons, as well as many civilian surgeons, lost sight of the emphasis that these reports also placed on adequate surgery. As early as 1943, numerous reports from the Mediterranean Theater, later supplemented by reports from the European Theater, substantiated the conclusions of the National Research Council workers regarding the ineffectiveness of local chemotherapy in wound infections. Soon afterward, a directive was issued forbidding the local use of the sulfonamides, and they were no longer placed in the first-aid kit in any form.

It is pleasant to be able to report that most of these errors and hesitations were avoided in the study of penicillin and streptomycin. The investigations were set up by civilian investigators working under the National Research Council, and the projects, when they were fully operative, were taken over and carried on with great success by members of the Army Medical Corps specially assigned to and specially qualified for the work. The result was that when these agents were made generally available, the principles of usage had been clearly established and their limitations and risks had been equally clearly defined. Both projects represent the type of integrated civilian-military research that, unfortunately, so many other projects do not, and point the way to future planning for research in a similar emergency.

The Implications of Military Surgery in the Postwar World

I hope that nothing that has been said will be interpreted to mean that the Medical Department of the United States Army did not do a competent job in World War II. It functioned superbly. No soldiers in any war ever had such care as was given to the American soldiers in the last war. If, on the other hand, what has been said seems to indicate that the formulation of policy of military surgery in World War II was a matter of evolution, it must be admitted that the implication is correct. The Medical Corps, like most other branches of the Army, entered on the emergency of World War II quite as unprepared as it had been at the outbreak of World War I. In large measure this was not the fault of the Surgeon General. For one thing, the American public, as always during years of peace, had shown no enthusiasm, but rather apathy and sometimes actual hostility, for planning for another war. Congress, the source of funds, had followed the same line.

Furthermore, and even more important, successive surgeons general of the Army, whatever their convictions, had little or no authority to act on them. In the midst of World War I, over the protests of the Surgeon General then in office, the Medical Corps of the Army, previously an entity in its own right, had been placed under the Service of Supply (later the Army Service Forces) and by this move, in spite of his sole responsibility for the health and medical care of the Army, the Surgeon General had been cut off from direct access to the Chief of Staff and the Secretary of War. Professional personnel, for all practical purposes, was reduced to the status of rations and ammunition. As the Chief Surgeon of the American Expeditionary Forces protested when the change was made: "The present organization . . . places a line officer of the General Staff in position to pass upon or present for higher consideration all matters of fundamental policy affecting the Medical Department. He can nullify the most carefully worked out program having for its object Medical Department efficiency." The Surgeon General, in short, could continue to raise his voice on medical matters, but he no longer had any certainty that it would be heard. He continued in this unhappy position in the interim between the wars and through most of World War II. By April, 1945, however, the anomaly of his status had given rise to so much confusion that it became necessary to clarify his duties and responsibilities by a War Department Circular, concurred in by the Secretary of War, who at that time assumed direct responsibility for the sick and wounded of the Army.

The anomalous position of the Surgeon General was responsible for many of the medical troubles encountered in World War II. Prestige cannot be established by regulations; rather, it is the product of successful achievement. Nevertheless, the position in which the Medical Department was placed in the organizational structure of the Army cannot be regarded as conducive to the enhancement of its prestige. The Surgeon General's advice might not be asked, even on matters that directly concerned the health and well-being of the troops. If it were requested or offered, there was no assurance that it would be accepted, translated into proper action or translated into any action at all. The situation demands correction: the Surgeon General must, of course, be subject in tactical matters to purely military command, but he must also again become master in his own medical house. His position must be so clarified that he can carry out his responsibilities and functions under the direction of a medically enlightened command, which is fully aware of the part played by the Medical Department in the actual business of warfare and which realizes, as Sir Alexander Hood has well put it, that "the medical services are the authorities on man and all that concerns him."

An important by-product of the anomalous position of the Medical Department in World War II was its lack of direct control over its own personnel. When that handicap was added to the structural organization without which, in spite of its cumber-

someness, an army in the field cannot operate, the inevitable result was a wastage of trained personnel that became increasingly acute as the war went on and that, had it lasted longer, might have been reflected in the care of the wounded. The problem was solved to some degree by the assignment of appropriate specialists to the points at which they could be most useful and by the concentration of patients with special types of injuries in centers equipped and staffed for their care; shortages of critical personnel, however, were always troublesome, and some of them were artificially created.

Such a situation must be avoided in the future. The medical profession is fully committed to the principle of specialization. It was employed in World War II far more extensively than in World War I because of two tendencies that had taken form in the interim between the wars. One comprised the efforts by civilian medical schools and hospitals to improve and standardize medical specialization by the provision of residencies and other facilities for postgraduate medical education. The other was the certification of specialists by the various qualifying boards. Neither of these tendencies, as already pointed out, existed prior to World War I, and it was the reservoir of specialists created between the wars that made possible the specialized and highly competent medical care given the wounded in World War II.

The philosophy of specialization in medical practice was based on too firm a foundation to have been overturned by a temporary, albeit catastrophic, interruption. The framework of its implementation, as a matter of fact, was actually strengthened by the experiences of the war and the performance of the specialists themselves. Specialization has now received legal recognition. It has been written into the laws governing the Veterans Administration, which, as a result, is providing for its charges medical care of a quality that it has never before provided. Equally strong efforts are now being made to continue specialization as an Army policy. The responsibility of the certifying boards and of teaching hospitals and medical schools, therefore, seems to be heavier than ever before, and the leaders in graduate educational endeavors must take full cognizance of the fact.

On the other hand, the policy of specialization must be applied with discretion and, so far as the Army is concerned, with understanding of military conditions. During World War II, as in every previous war, medical officers of the Regular Army necessarily assumed administrative positions. Their training had presumably fitted them better for those posts than it had for specialized professional service, whereas the civilian components of the Medical Corps were in most instances untrained for administrative posts, in which their specialized training and experience would have been wasted. Generally speaking, this is a sound policy. On the other hand, the experience of World War II amply demonstrated the fallacy of the assumptions that a medical officer trained in a peacetime army was a priori fitted to assume a key administrative position during war and that a civilian surgeon necessarily lacked the qualities of leadership, judgment and vision required for it.

The degree of specialization to be required in the future Regular Army is difficult to determine at present. The size of the future military establishment is still undetermined, and specialization, to be practiced effectively, requires concentrations of clinical material. The wisest plan may be for the Medical Corps of the Regular Army to provide the administrative structure and the general care of the troops, as well as the medicomilitary planning and training operations, leaving specialized hospital care to be supplied by a system of civilian consultants or of integrated federal medical service. The important consideration at present is not how the specialized care is to be supplied but that its necessity be recognized and, at the same time, the pitfall of too narrow specialization be avoided. It must also be constantly borne in mind that specialized practice emphasizes remedial medicine and that the Medical Department is a great deal more than a salvage service. The practice of preventive medicine and the planning for future operations are even more vital functions in war than in peace, In both its most valuable function is its advice to command.

The problem is not quite so simple, however, as this statement of policy implies. Other considerations are linked with purely military matters. During the war obvious shortages of personnel developed and certain specialists were always in critical supply, but the opinion was that once the war had ended, these difficulties would resolve themselves. They have not resolved themselves, nor does any thinking physician believe that they are likely to, at least under the system by which federal services are now operated.

It would be difficult to imagine a more wasteful and extravagant plan, for example, than the one on which hospitalization in this country is currently conducted. We have a system of private hospitals, of widely varying size and excellence. We also have, exactly as we had at the beginning of World War II, a fourfold, parallel system of federal hospitalization, including separate establishments for the Army, the Navy, the Veterans Administration and the Public Health Service, with confusion worse confounded by the maintenance of separate installations, sometimes only a few hundred yards apart, for the Air Forces and the Ground Forces. What this means in terms of wastage of material and equipment and money is perfectly obvious; what it means in terms of wastage of professional personnel, particularly of specialized personnel, may not at first glance be so clear.

It has been conservatively estimated that the various governmental agencies supplying medical care will soon need half a million hospital beds. That is a third of the present hospital-bed capacity of the whole country. As the need for bed space multiplies, so will the need for professional personnel, particularly for specialized personnel, who cannot be supplied by the present system. Sane thinking therefore indicates the merger of the present separately maintained federal establishments, at least on the hospital level in the Zone of the Interior, which would reduce the needed professional personnel by 50 to 75 per cent, greatly increase efficiency of operation and greatly reduce costs. The conservation of specialized personnel, along with their efficient use, is one of the lessons that should have been learned for all time from the surgical experiences in World War II.

At present, from the standpoint of medical practice as well as in a number of other respects, we are acting from day to day. We have no plans and, worse, we have no principles to guide our course of action. Such a situation must not be permitted to continue. The surgical problems of World War II far exceeded in magnitude those of World War I. The problems of a possib'e third world war, about which we shall be criminally negligent if we are not entirely realistic, are likely to exceed to a staggering degree those of World War II. The end of World War II may indeed have marked the end of an era in military surgery, which for centuries had followed a pattern that, although progressively more demanding, was still essentially similar. Much of the knowledge we now possess, however, may become irrelevant and useless in this new era. There will necessarily be a new concept of war wounds. Radiation, blast and burn injuries of atomic origin will pose problems of management different from those hitherto associated with surgical care, and there must be a new concept of traumatic surgery in terms of regional injury.

Furthermore, the introduction of atomic weapons is likely to wipe out the old concept of echelons of combat and areas of security, and to bring civilians and military forces together into a single zone of combat. Atomic warfare is likely to cause an instantaneous flood of casualties, such as no battle in the history of the world ever before produced. It will require the full use of all hospital facilities, on an over-all basis, with no wastage of beds, as well as the strategic placement of all equipment for general use as needed. Above all, it will require the mobilization of the entire medical personnel of the Nation on a disaster basis. There can be no distinction between military and civilian medical responsibility, for there will be no distinction between military and civilian injuries. It will require a mobility and speed of assignment of medical and surgical personnel such as has never before been necessary. There can be no more wastage of physicians. The problem, indeed, may be to keep the medical personnel of the country protected and alive and sufficiently uninjured to carry out their functions.

I should not like to end on this note. I do not believe that so dark a future will come soon, or that it is inevitable. But we should be lacking in realism and deserving of our fate if we did not face the possibilities frankly and take steps to forestall, prevent and prepare for disaster. Changes will be necessary: changes in the concept of medical education, changes in the methods of graduate education, changes in the plan of medical practice and changes in the relation and attitude of the civilian medical profession toward the federal medical services, including the Army and the Navy. To bring them about will take authority on a high level, which is now lacking on any level and which, when it is set up, must be exercised with wisdom and judgment and great discretion. Without medical statesmanship of a high order, these objectives cannot be attained.

Obviously, the experiences of World War II cannot be transferred directly to a possible atomic war. They must not, however, be discarded lightly. For the present, at least, they are all we have to go on. They supply some solid point of departure, in spite of the changes that must be made. The future of atomic warfare is uncertain, but the lessons of the last war will help, and certainly if we learn them, we shall be in a position of vantage that we have never before occupied at the beginning of any previous war.

PROTEIN NUTRITION*

The Therapeutic Use of a Digest of Liver Protein, Especially in Patients with Cirrhosis of the Liver

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IN THE treatment of many diseases it is often desirable to administer a part or, occasionally, all of the patient's food in a liquid form. Such a liquid formula should satisfy the nutritional needs of the patient in a concentrated, easily assimilable form. Particular interest has recently been evidenced in food supplements designed for patients needing additional protein. A high-protein intake has been shown to be especially desirable in certain conditions, such as cirrhosis of the liver,[1] nephrosis,[2] peptic ulcer,[3] healing of surgical wounds[4] and burns[5] and states of malnutrition due to restricted intake.

The supplement¶ described in this paper is derived from liver protein by partial hydrolysis. Investigations on dogs with low plasma protein concentration due to depletion have shown that the protein of beef liver is active in building plasma albumin.[6–8] This activity is not so effective as that of beef serum and egg white but about the same as that of beef muscle and casein. Thus, it was assumed before study that this protein would be adequate to maintain nitrogen equilibrium or a positive nitrogen balance in human beings, and the following investigation supports this assumption.

In addition to adequate protein, an ideal liquid supplement should contain sufficient energy value to prevent utilization of the protein for fuel. The liver protein hydrolysate contains only a small amount of carbohydrate and fat so that if the patient's diet does not furnish sufficient calories, sugar or starch or some other source of energy may be added to the liver protein digest. The liver protein digest contains ample amounts of most of the well known fractions of the vitamin B complex and is also a good source of the less familiar members of this group but contains no appreciable amounts of the other vitamins.

A supplement should be as palatable as possible and free from disagreeable side effects. The liver protein digest, flavored with chocolate, is palatable enough to be taken by most patients and, except for a laxative action in some cases, is without disagreeable side effects.

TABLE 1. *The Composition of Granular Liver Protein Digest.**

SUBSTANCE	AMOUNT	AMOUNT IN DAILY DOSE (180 GM.)
	per 100 gm.	
Calories	354	640
Protein	55 gm.	100 gm.
Carbohydrate	33 gm.	60 gm.
Fat	0.9 gm.	1.5 gm.
Vitamins:		
Thiamine	3.5 mg.	6.0 mg.
Niacinamide	22.0 mg.	40.0 mg.
Biotin	0.16 mg.	0.3 mg.
Inositol	75.0 mg.	128.0 mg.
Riboflavin	6.6 mg.	10.0 mg.
Calcium pantothenate	7.6 mg.	13.0 mg.
Folic acid	0.28 mg.	0.5 mg.
Pyridoxine	0.8 mg.	1.4 mg.
Choline	390.0 mg.	680.0 mg.
Available amino acids:		
Arginine	3.5 gm.	6.0 gm.
Cystine	2.7 gm.	4.6 gm.
Glutamic acid	7.4 gm.	12.4 gm.
Histidine	1.6 gm.	2.7 gm.
Isoleucine	2.3 gm.	3.8 gm.
Leucine	3.8 gm.	6.3 gm.
Lysine	5.7 gm.	9.5 gm.
Methionine	0.9 gm.	1.5 gm.
Phenylalanine	1.9 gm.	3.2 gm.
Threonine	2.5 gm.	4.2 gm.
Tryptophane	0.4 gm.	0.7 gm.
Tyrosine	1.4 gm.	2.3 gm.
Valine	3.0 gm.	5.0 gm.

*From data furnished by the manufacturer, except the protein content, which was determined in this laboratory and is slightly higher than that given by the manufacturer.

MATERIAL AND METHODS

Preparation and Composition of Liver Protein Digest

Liver protein digest is a dry, slightly hydroscopic, granular powder prepared by vacuum drying of a partial enzymatic (papain) hydrolysate of the liver pulp — the portion of the beef liver remaining after hot aqueous extraction of the anti-pernicious-anemia factor. The final powdered digest contains by weight

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¶"Ledinac," prepared and kindly provided by the Lederle Laboratories, Pearl River, New York.

54.5 per cent hydrolysate of the liver pulp, 37.8 per cent spray-dried malt and 7.5 per cent bitter chocolate.

This preparation is naturally high in components of the vitamin B complex, with the exception of thiamine, which has been added. In Table 1, which shows the vitamin content as determined by the manufacturer, it can be seen that 100 gm. of liver protein digest furnishes more than the National Research Council optimum allowances of thiamine, riboflavin and nicotinamide.[9] Optimum values for the other components of the vitamin B complex have not been established, but moderate amounts of biotin, calcium pantothenate, folic acid and pyridoxine are present in this material. In addition, lipotrophic factors, such as choline, inositol and methionine, are included.

Table 1 also shows the amino acid content of the liver protein digest. All the amino acids that have been shown to be essential in man[10] are present.

The liver protein digest is easily suspended in hot water; although a precipitate settles on standing, this may be quickly resuspended by shaking. Usually, 180 gm. of the digest dissolved in water to make 1 liter and containing approximately 100 gm. of protein was given daily.

Nitrogen-Balance Studies in Normal Subjects

Food intake and nitrogen balance were studied in 5 normal persons in good nutritional status. Each received a basic diet containing 25 gm. of protein and between 2000 and 4000 calories. Throughout the entire period of study the individual caloric intake was kept constant, and the protein studied was substituted isocalorically for carbohydrate. In 4 cases the activity of the liver protein digest was also compared with another protein of known biologic value. Daily determinations of the urine nitrogen were made by the micro-Kjeldahl method, and three-day or five-day determinations of the pooled stool by the macro-Kjeldahl method. Total plasma proteins and albumin globulin fractionations were determined by the Howe method.[11]

Plasma Protein Regeneration

Plasma protein levels were followed in the 5 normal subjects, in 11 patients with portal cirrhosis of the liver, in 1 patient with nephrosis, in 1 patient with peptic ulcer and in 4 patients with uncomplicated malnutrition. The regeneration of the plasma proteins is discussed below.

Clinical Studies

Sixty-five patients received the liver protein digest daily over periods of one to seventy days. In 11 cases it was necessary to discontinue the study—in 3 because the disease had progressed to coma, in 3 because the patients refused to take the material, in 3 because of vomiting in 1 and severe diarrhea in 2 and in the other 2 because the patients were discharged or transferred. Thus, 54 patients were studied, and the results of treatment are discussed below under the respective diseases.

Ten of the patients studied were placed on weighed diets and the calorie and protein intakes calculated. Most of the remaining patients received hospital diets, although a few were placed on special low-salt or Sippy regimes as required by the disease. Body weight was followed so far as possible in all patients. In patients with liver disease the serum bilirubin,[12] the cephalin-flocculation[13] and thymol-turbidity tests,[14] the prothrombin time,[15] the bromsulfalein retention and the plasma protein concentration were followed.

Results

Tolerance

Although the initial flavor of the liver protein digest is not distasteful, the preparation leaves a bitter liver taste in the mouth that to some is disagreeable. It was soon found that the psychologic introduction of this material as a medicine containing "liver and vitamins" obtained the co-operation and interest of the patients. A few patients, however, found the flavor so distasteful that the material could not be tolerated.

The laxative effect of the liver protein digest also limited its usefulness in some patients. This effect was particularly noticeable in patients who had gastrointestinal disorders associated with diarrhea, although even in some of these the diarrhea stopped after a few days of treatment with the liver protein digest. Most patients, however, noticed either no effect on their bowel habits or a slight increase in the number of bowel movements daily. This slight laxative effect could be ameliorated by urging frequent small feedings. Only one patient had diarrhea to such an extent that the digest had to be discontinued. The substance in the digest causing the laxative effect is not known but has been observed in the use of most oral liver preparations. It was certainly a major drawback to the usefulness of this protein digest in a few patients.

Nitrogen-Balance Studies in Normal Subjects

The results in 2 of the 5 normal subjects are demonstrated in Figure 1. These subjects were placed on a basic 25-gm. protein diet, and after equilibrium or minimum negative nitrogen balance had been achieved, a lactalbumin preparation was given to raise the protein intake to 75 gm. After seven days these subjects were returned to the basic 25-gm. protein diet for a short period, and a second trial period was then instituted by the addition of 50 gm. of liver protein digest. The intake was maintained throughout at about 2900 calories. The amount of nitrogen retained during the administration of liver protein digest was even slightly greater than that during the administration of lactalbumin. Plasma protein concentrations remained at normal levels throughout.

In the 3 other normal subjects, nitrogen-balance studies were carried out after an initial period during which the patient received the 25-gm. protein basic diet. The intake was 1900, 2500 and 4000 calories a day, depending on individual needs, and additional protein in amounts of 26, 50 and 46 gm. daily respectively was supplied isocalorically by the liver protein digest.

A positive nitrogen balance was achieved in each case, and the level of plasma proteins remained normal throughout.

Plasma Protein Regeneration

In the normal group studied, no significant changes were observed in the plasma proteins, which remained within the normal range throughout the study. This was also true of the patient with peptic ulcer and 3 patients with uncomplicated malnutrition. The results in liver disease are discussed below in connection with the other findings. The regeneration of plasma proteins was particularly striking in a patient with nephrosis, and this case is presented in detail:

L. P., a 38-year-old man with chronic glomerulonephritis and the nephrotic syndrome was given a diet containing 100 gm. of protein and a supplement of liver protein digest containing an additional 100 gm. of protein. On admission he had massive generalized edema, proteinuria and hypoalbuminemia. The proteinuria remained unchanged during the 30 days of study but, as shown in Figure 2, the edema disappeared, the body weight fell and the plasma albumin concentration rose from 1.5 to 3.5 gm. per 100 cc. After the edema had disappeared there was a gradual gain in body weight from 98 to 105 pounds. During the study the food and supplement furnished from 2000 to 3000 calories a day. A markedly positive nitrogen balance of about 20 gm. daily was maintained during the entire period.

Liver Disease

Portal cirrhosis. Nineteen patients in whom the diagnosis of portal (Laennec) cirrhosis had been made were studied. The past history in all revealed an excessive alcoholic intake and a food intake relatively low in protein and foods containing the vitamin B complex. The disease in these patients was roughly classified as mild, moderate and severe, on the basis of the duration of disease, physical examination and derangement of liver-function tests (Table 2). In this connection the most valuable physical sign was the presence of ascites. Edema was present in only a few patients who did not have ascites. The liver size was not used as a criterion of the severity of the liver involvement in classification of the patients. Of the liver-function tests performed in this group, the cephalin-flocculation and thymol-turbidity tests had the greatest prognostic value. The bromsulfalein retention and the prothrombin time varied greatly and seemed to have little value in determining the severity of liver dysfunction or prognosis. The icteric index and serum bilirubin concentration were of importance only so far as they changed with the course of the disease and did not indicate the extent of permanent

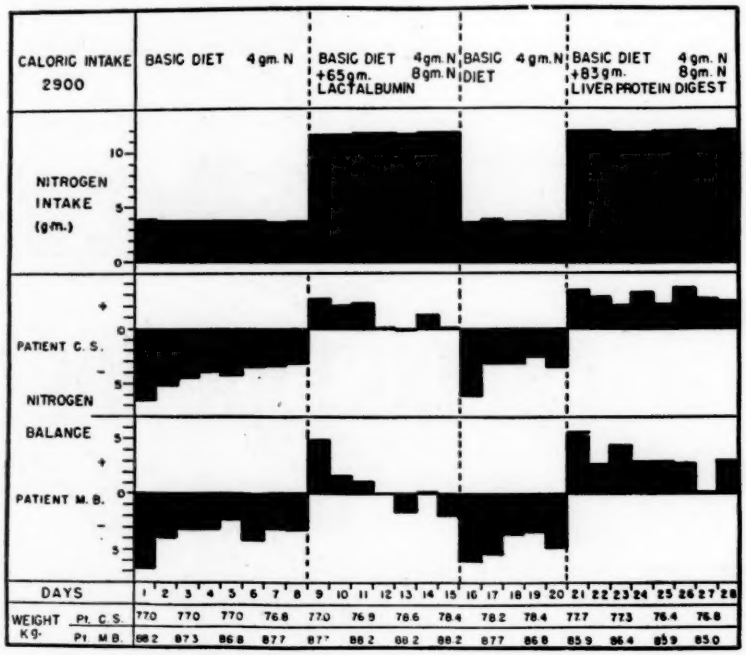
CALORIC INTAKE 2900
BASIC DIET 4 gm. N
BASIC DIET 4 gm. N +65 gm. 8 gm. N LACTALBUMIN
BASIC DIET 4 gm. N
BASIC DIET 4 gm. N +83 gm. 8 gm. N LIVER PROTEIN DIGEST
NITROGEN INTAKE (gm.)
PATIENT C. S. NITROGEN BALANCE
PATIENT M. B.
DAYS
WEIGHT KG. Pt. C. S.
Pt. M. B.

FIGURE 1. *Nitrogen Balance Studies on Two Normal Subjects.*

damage or the prognosis. The total protein and albumin-globulin fractionation were not determined in all cases but showed definite trends in each group. In the mild cases the plasma albumin concentration was above 3.35 gm., and the globulin fraction concentration was below 2.8 gm. per 100 cc. In the moderate cases the albumin concentration was between 2.6 and 3.7 gm., and the globulin between 3.2 and 3.6 gm. per 100 cc. In the cases classified as severe the plasma albumin was below 2.5 gm., and the globulin between 3.3 and 4.3 gm. per 100 cc.

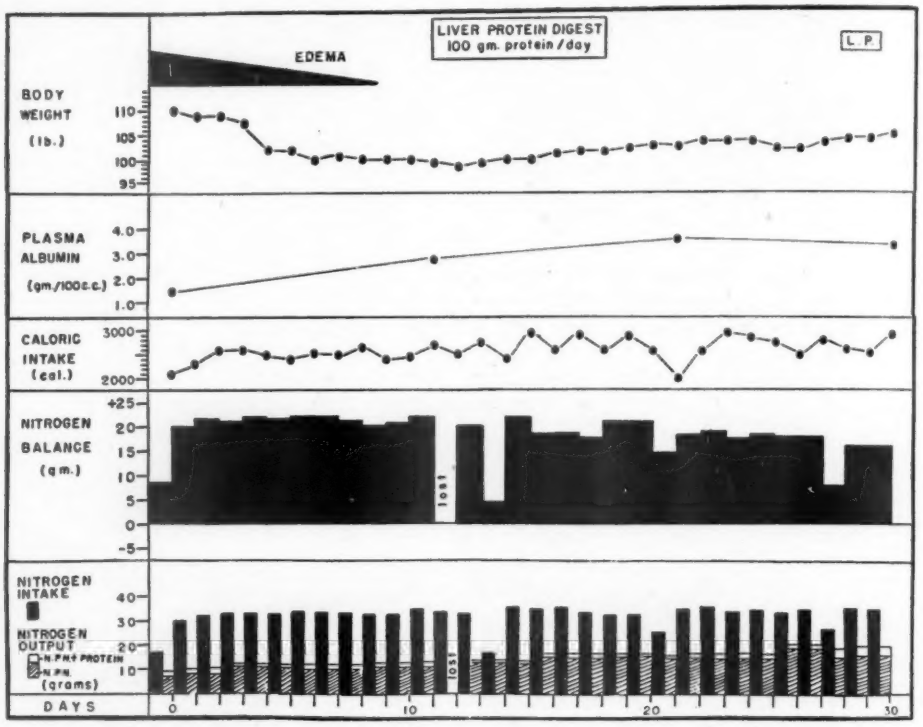

FIGURE 2. *Essential Data in a Patient with Chronic Glomerulonephritis and the Nephrotic Syndrome.*

All patients received a daily supplement of liver protein digest containing 100 gm. of protein in addition to a hospital diet supposedly high in protein and calories. No attempt was made to keep the fat low in these diets. In 6 cases the total caloric and protein intake was averaged for five-day periods from weighed diets (Table 3). The basic diet was planned to contain 300 gm. of carbohydrate, 100 gm. of protein and 50 gm. of fat. The actual daily intake ranged from 1800 to 2800 calories and from 120 to 200 gm. of protein.

Nine patients were classified as having mild cirrhosis. After receiving liver protein digest from twelve to thirty days, the improvement in this group was marked. Table 4 shows the most striking changes. The livers, which had been enlarged in all these patients before treatment, decreased in size after treatment and were palpable more than 1 cm. below the costal margin in the midclavicular line in only 2 cases. It seems likely that in this group the enlarged livers were due to fatty infiltration and the disappearance of this fat accounted for the rapid decrease in size. The plasma protein concentration was followed in 4 patients. Two showed an increase of plasma albumin concentration of about 1 gm. per 100 cc., whereas in the other 2 the albumin concentration remained constant or slightly decreased. In only 1 patient (Case 4) was there an increase in plasma globulin. The serum bilirubin concentration was elevated in 6 cases, in all of which the total bilirubin decreased to normal, although the direct reacting bilirubin remained elevated in 4.

In the 5 cases classified as moderate, 4 patients showed marked and 1 moderate improvement (Table 5). Ascites and edema decreased or vanished, and the liver size diminished. The plasma proteins were determined in 4 patients of this group; the plasma albumin concentration remained constant in 1 and was increased in 3. The globulin concentration increased slightly in 3 patients. The serum bilirubin determination was followed in only 2 cases, in which it decreased to normal total bilirubin concentration, although 1 patient continued to have an elevated prompt, direct bilirubin concentration.

In the group of 5 patients with severe cirrhosis, 3 died and the others showed only minimal improvement (Table 6). The past histories in these patients

revealed a long duration of the disease before the present admission to this hospital. Ascites improved in only 1 case, and in the other 4 repeated paracenteses were necessary. The plasma protein concentration was followed in 3 cases and showed little change after treatment. The serum bilirubin concentration changed little during the period of treatment with liver protein digest.

Infectious hepatitis. Five patients with infectious hepatitis were given the liver protein digest in the same daily amounts as those given in cirrhosis of the liver. Rapid improvement after the initial phase of the disease was observed in all patients, but from this small series it is impossible to conclude that the liver protein digest influenced the course of the disease. It was well tolerated in all cases after the initial acute gastrointestinal symptoms associated with the disease had improved.

Burns

The liver protein digest was taken as a food supplement in amounts from 95 to 540 gm. a day by 5 patients with thermal burns. The data concerning these patients are presented in Table 7. All had severe burns. One patient (Case 36), with a third-degree burn of 46 per cent of the body surface, died on the thirteenth hospital day, nine days after the initial administration of liver protein digest. In the others, who consumed variable amounts a day for periods ranging from thirty-two to seventy days, the nutritional status was either improved or maintained. In 2 patients (Cases 34 and 35) the liver protein digest was the chief source of protein during the period of administration. In the others various supplements, both oral and intravenous, were used.

A patient (Case 35) in whom the liver protein digest was the chief source of protein for a month, improved more rapidly during this period than during that in which he had received other protein supplements in approximately equivalent amounts. One patient (Case 34) developed a rash that was at first papular, and then became pustular and disappeared soon after the liver protein digest had been discontinued. This was the only suspicious sign of

TABLE 2. *Classification of Cases of Cirrhosis.*

Degree of Cirrhosis	Case No.	Ascites	Edema	Liver Size*	Cephalin Flocculation	Bromsulfalein Retention†	Thymol Turbidity‡	Prothrombin Concentration	Icteric Index
				cm.		%		%	
Mild	1	0	++	4	+	32	1.80	90	15
	2	0	0	6	0	32	1.32	45	35
	3	0	0	2	+	—	—	100	100
	4§	++	++	5	0	20	1.10	—	40
	5	0	0	6	0	28	—	100	15
	6	0	0	4	++	—	1.77	—	25
	7	0	++	3	++	12	2.68	100	5
	8	0	0	7	+	12	2.68	—	35
	9	0	0	3	++	20	3.90	78	4
Moderate	10	++	++	1	+++	32	4.37	—	10
	11	+++	0	4	++++	44	2.09	89	100
	12	+++	+	4	++++	—	—	—	100
	13	++++	+	Not palpable	++++	28	3.40	100	6
	14	++	++	10	++++	—	2.33	80	75
Severe	15	+++	++	Not palpable	++++	—	4.01	68	50
	16	++++	+	4	++	8	3.33	78	25
	17	+++	++	Not palpable	++	36	—	100	8
	18	++++	++	Not palpable	++++	—	4.06	—	17
	19	++++	+	Not palpable	++++	40	4.14	—	50

*Distance palpable below the costal margin.
†At forty-five minutes after intravenous injection of 5 mg. per kilogram of body weight.
‡Normal range: 0 to 1.68.
§This patient had a moderate degree of heart failure, with chronic passive congestion.

TABLE 3. *Calorie and Protein Values of Basic Diet and Liver Protein Digest Supplement.**

Case No.	Calorie Intake								Protein Intake							
	5 days	10 days	15 days	20 days	25 days	30 days	35 days	40 days	5 days	10 days	15 days	20 days	25 days	30 days	35 days	40 days
									gm.	gm.	gm.	gm.	gm.	gm.	gm.	gm.
16	1800	2500	2200	2500	2700	2700	2600	2200	130	160	140	190	210	200	200	200
17	2800	1800	2200	2300	1800				230	140	190	190	160			
11	1500	2500	2400	2700	2600				120	160	180	200	200			
3	2600	2700	2200						200	220	210					
8	2600	2600	2800	2700	2600				210	180	210	190	180			
5	2400	2300	2200						200	180	170					

*Daily averages in five-day periods.

sensitivity in any of the patients treated with the digest.

Peptic Ulcer

Liver protein digest was administered to 3 patients with duodenal ulcer. In 1 of these it was used as a supplement to a soft diet and in the other 2 as the sole source of oral protein for three to five days. These last 2 patients are of interest in that they were admitted with marked pyloric obstruction and almost complete gastric retention. The liver protein digest was administered through a gastric tube at hourly intervals, and gastric contents were aspirated to relieve distention. This was necessary every four hours for the first twenty-four hours, but by the third or fourth day the obstruction had been completely relieved and aspirations were no longer necessary. The patients were then placed on a soft diet, and liver protein digest was given as a supplement. The weight gains in these patients were remarkable, 1 patient gaining 18 pounds in ten days, and the other 10 pounds in six days. More studies are being carried out on patients with peptic ulcer. No conclusions can be drawn from this series, but the results, particularly in obstructive lesions, are hopeful and are similar to those recently reported by Co Tui[3] with a casein hydrolysate.

Peripheral Neuritis

The liver protein digest was given to 3 patients with peripheral neuritis associated with chronic alcoholism. In 1, a thirty-one-year-old woman with moderate diarrhea on admission, the liver protein digest had to be discontinued after five days because the diarrhea was aggravated. Nevertheless, during that time, the patient gained 5 pounds in weight, and the symptoms and signs of peripheral neuritis, which had been relatively acute at onset, were markedly diminished. The other 2 patients, both with a longer history of peripheral neuritis, had gradual improvement such as one would expect with optimum vitamin therapy. Approximately 180 gm. of the liver protein digest was administered daily for thirteen and forty-eight days respectively, when the patients were discharged from the hospital.

Malnourishment

Fourteen patients exhibiting various degrees of malnutrition due to restricted food intake were studied. In 6 the restricted diet was voluntary and was usually accompanied by chronic alcoholism. The remaining patients had a variety of conditions, including bronchiectasis, Parkinson's disease, healed duodenal ulcer, hemophilia, hypernephroma and postoperative malnourishment. These patients received the liver protein digest in amounts of approximately 100 gm. of protein daily for four to twenty-three days. Whenever possible, changes in body weight were observed, and in 4 patients nitrogen balance and plasma protein concentrations were followed.

No improvement was shown in 2 patients — one with a hypernephroma extending into the hepatic vein, who developed marked ascites and eventually died, and the other, a patient with Parkinsonism who presented a feeding problem and was transferred to a nursing home. Of the other patients, 2 were followed for four and five days respectively

TABLE 4. *Changes Observed during Treatment with Liver Protein Digest in Patients with Mild Cirrhosis.*

Case No.	Liver Size	Serum Bilirubin		Plasma Protein		Results
		total	direct	albumin	globulin	
	cm.	*mg./100 cc.*	*mg./100 cc.*	*gm./100 cc.*	*gm./100 cc.*	
1	4 to 0	1.38 to 0.76	0.48 to 0.31	—	—	Marked improvement
2	6 to 0	1.14 to 0.66	0.46 to 0.19	3.70 to 4.69	2.57 to 2.57	Marked improvement
3	2 to 0	3.40 to 1.00	1.88 to 0.52	3.65 to 4.65	2.81 to 2.03	Marked improvement
4	5 to 1	4.82 to 0.64	2.35 to 0.11	3.35 to 2.79	1.76 to 3.40	Marked improvement
5	6 to 0	0.50 to 0.11	0.06 to 0.07	3.85 to 3.78	2.02 to 1.98	Marked improvement
6	4 to 0	2.70 to 1.00	1.40 to 0.35	—	—	Marked improvement
7	3 to 1	0.70 to 0.38	0.01 to 0.12	—	—	Marked improvement
8	7 to 3	1.56 to 1.14	0.59 to 0.38	—	—	Marked improvement
9	3 to 2	0.64 to 0.74	0.25 to 0.18	—	—	Moderate improvement

TABLE 5. *Changes Observed during Treatment with Liver Protein Digest in Patients with Moderate Cirrhosis.*

Case No.	Liver Size	Ascites	Serum Bilirubin		Plasma Protein		Result
			total	direct	albumin	globulin	
	cm.		*mg./100 cc.*	*mg./100 cc.*	*gm./100 cc.*	*gm./100 cc.*	
10	1 to 0	++ to 0	—	—	2.6 to 2.9	3.2 to 3.7	Marked improvement
11	4 to 1	+++ to 0	2.85 to 0.82	1.54 to 0.62	2.7 to 4.2	3.2 to 3.8	Marked improvement
12	4 to 1	+++ to +	—	—	—	—	Marked improvement
13	Not palpable	++++ to +	0.66 to 0.72	0.48 to 0.18	3.5 to 3.6	3.6 to 3.2	Moderate improvement
14	10 to 2	++ to 0	—	—	3.7 to 4.1	3.6 to 3.1	Marked improvement

and showed only slight improvement. The remaining 10 patients received the liver protein digest for nine to twenty-three days with moderate to marked improvement. Weight gains ranged from 1 to 10 pounds, averaging 6 pounds for a two-week period of treatment. The 3 postoperative patients showed rapid wound healing and weight gain. The patient with hemophilia had an ulcer on the left leg and was in this group. In another patient, a seventy-five-year-old woman with a poor dietary history, the initial total protein concentration was 4.8 gm., with an albumin concentration of 1.71 gm. per 100 cc. For fifteen days she received 100 gm. of protein from liver protein digest, in addition to a diet containing 50 gm. of protein and about 1200 calories, and during that time the total protein rose to 6.18

TABLE 6. *Changes Observed during Treatment with Liver Protein Digest in Patients with Severe Cirrhosis.*

Case No.	Liver Size*	Ascites	Serum Bilirubin		Plasma Protein		Result
			Total	Direct	Albumin	Globulin	
	cm.		*mg./100 cc.*	*mg./100 cc.*	*gm./100 cc.*	*gm./100 cc.*	
15	Not palpable	+++ to +	3.08 to 2.24	0.79 to 0.66	2.5 to 2.8	3.9 to 3.0	Death in coma
16	4 to 4	++++ to ++	2.71 to 1.42	1.01 to 0.45	2.5 to 2.8	3.3 to 3.2	Moderate improvement
17	Not palpable	+++ to ++++	1.04 to 1.04	0.25 to 0.35	—	—	Death in coma
18	Not palpable	++++ to ++++	1.52 to 1.48	0.36 to 0.48	—	—	Death of hemorrhage from esophageal varices
19	Not palpable	++++ to ++++	5.92 to 3.00	2.44 to 1.16	2.1 to 1.7	4.3 to 4.1	Slight improvement

*Distance palpable below the costal margin.

markedly underweight. After ten days of treatment the ulcer was almost completely healed, and the patient had gained 6 pounds.

Nitrogen balances were followed in 4 patients, in 2 of whom the liver protein digest was given to total 50 per cent of a 200-gm. protein diet (2300 to 2700 calories). These two patients retained an average of 11.7 and 7.6 gm. of nitrogen daily over a ten-day period. Another patient, who received 65 gm. of protein from the liver protein digest and a basic diet containing 75 gm. of animal and vegetable protein, retained an average of 8.6 gm. of nitrogen daily. The last patient, an alcoholic addict, was put on a basic 25-gm. protein diet for ten days, during which he was in nitrogen equilibrium. At that point, liver protein digest was added isocalorically to the diet, bringing the protein intake to 75 gm. daily over the next ten-day period. This patient retained an average of 5.7 gm. of nitrogen daily.

Plasma proteins were followed in 3 of the 4 cases in which nitrogen balances were determined. The plasma protein concentrations were not abnormal gm., with an albumin concentration of 3.30 gm. per 100 cc. although she gained only 4 pounds.

Discussion

Good food, properly selected and in adequate amounts and taken by mouth, is the most effective and satisfactory method of supplying essential nutrients. Purified diets may lack some essential nutrient as yet unknown. Thus, monkeys fed purified diets containing all the known dietary essentials fail to gain weight and develop a macrocytic anemia that is cured by liver.[16] This missing component has recently proved to be the synthetic *Lactobacillus casei* factor.[17] In view of this and similar investigations, it is unlikely that all the essential nutrients are known. It seems, therefore, a good practice to supply natural foods or their derivatives as sources of calories, protein and vitamins. Recently, it has become the custom for physicians to prescribe large amounts of one vitamin or a multivitamin capsule for their patients. The administration of large amounts of a single vitamin to the exclusion of others

TABLE 7. *Liver Protein Digest in the Treatment of Patients with Thermal Burns.*

Case No.	Sex	Body Surface with Third-Degree Burn	Nutritional Status			Interval before Treatment	Duration of Treatment	Amount of Liver Protein Digest	Weight Change	Result
			on entry	beginning of treatment	end of treatment					
		%				*days*	*days*	*gm./day*	*lb.*	
34	F	20	Fair	Poor	Fair	730	36	450	+2	Slow healing
36	M	46	Fair	Fair	—	4	9	94	—	Death
33	F	15	Fair	Fair	Fair	13	70	50 to 150	−1	Moderate healing
35	M	15	Good	Fair	Good	94	32	540	+6	Rapid healing
37	M	10	Good	Fair	Fair	84	37	167	0	Moderate healing

may be dangerous,[18] and few multivitamin capsules can be considered to supply in optimum amounts all the nutrients falling into this class. It seems evident, therefore, that a natural product containing the known essential nutrients is the best means of supplying a diet supplement. The liver protein digest admirably meets these requirements so far as protein and the vitamin B complex are concerned. It should be emphasized, however, that the digest does not provide other vitamins or sufficient calories in itself to prevent the burning of protein for energy.

Mixtures of nutrients in various combinations and amounts have been used as diet supplements for years and have recently been re-emphasized in protein feeding.[19, 20] In many cases they form the greater part of the food intake and thus must be planned with care to meet all the possible requirements. This is difficult for the physician without a particular interest in nutrition, especially in providing the vitamin B complex, and the liver protein digest, given with sufficient calories, vitamin C and, if necessary, the fat-soluble vitamins, therefore forms an important addition to the dietary armamentarium.

In addition to supplying nutrients, a food supplement should be palatable and without unpleasant side-effects. The bitter aftertaste of the liver protein digest is unpleasant to many patients, and in fact some took it only because they were convinced of its value. A few could or would not take the mixture at all. The laxative effect of the digest was also severe enough in some patients to require discontinuance of the mixture. Many others had an increase in the number of bowel movements a day that was not distressing, however.

That the liver protein digest will maintain nitrogen equilibrium in normal subjects when it is used as the chief source of protein is clearly demonstrated in the 5 normal persons described above. Furthermore, in 4 patients who had lost weight it was possible to maintain a strongly positive nitrogen balance. Plasma protein regeneration with a strongly positive nitrogen balance was evident in a patient with nephrosis, in whom the liver protein digest formed about half the protein intake, and in a patient with severe malnutrition.

Recent studies have emphasized the value of food intake in the treatment of portal cirrhosis of the liver. Special emphasis has been placed on protein and the vitamin B complex,[1] methionine and choline.[21, 22] The presence of these substances makes the liver protein digest theoretically exceptionally good in the treatment of this condition. The results in the 19 patients with cirrhosis support this view. In our experience, the improvement was at least as good if not somewhat better than that with any other means of administering the food elements necessary. These results, in addition to the relative ease of administration of such a diversity of substances, make the liver protein digest extremely useful in the specific therapy of cirrhosis of the liver.

It has been repeatedly pointed out that the nutritional requirements of patients with thermal burns are high.[5, 23] This is especially true of protein, large amounts of which are lost from the burn surface[24] and in the urine as nonprotein nitrogen.[25] These patients are usually extremely ill and have marked anorexia so that attaining the nutritional requirements is often difficult and requires frequent changing of the dietary supplements to add variety to the food intake. In this way the liver protein digest formed a useful protein suplement in the patients studied and proved to be at least as satisfactory as the other supplements used.

Peripheral neuritis in alcoholism is generally regarded as a deficiency disease,[26] thiamine being specifically implicated.[27] Most patients with this condition have evidence of multiple dietary deficiencies so that rational therapy should be directed toward a more complete replacement therapy than with thiamine alone. The results presented above do not indicate any more beneficial effects than those afforded by other means of attaining adequate intake of nutrients; in fact, in a patient with peripheral neuritis complicated by diarrhea, the digest had to be discontinued because of increase in the latter symptom. Nevertheless, the improvement in all 3 patients with peripheral neuritis was about what one would expect from optimum dietary therapy. More than 10 mg. of thiamine was supplied daily to these patients in food and liver protein digest.

The etiology of peptic ulcer remains unknown, although there is no doubt that psychologic factors play an important role. Many patients suffering from peptic ulcer improve markedly under almost any regime that offers relief from psychologic problems, as well as under local and general medical treatment. Local treatment of the ulcer is best achieved by reduction of gastric acidity through the use of buffering substances. General medical treatment includes hydration, regulation of acid-base balance and improvement of general nutrition. Obstruction of the pylorus in peptic ulcer may be due to either edema or scar formation. It is often difficult to differentiate these conditions without a therapeutic trial. In the 2 cases of ulcer discussed above complete six-hour gastric retention was shown by x-ray study before treatment. It was believed by many observers that the obstructions were due to scar formation, and we were surprised at the rapidity with which these obstructions were relieved, indicating that they had been due to edema and inflammation. The liver protein digest offers an excellent buffering agent as well as a good food and if given at frequent intervals seems to offer a satisfactory method of treatment. More studies will be necessary to determine the efficacy of this therapy in ulcer patients.

Summary

A partial enzymatic digest of liver protein was administered as a food supplement to 65 patients. The digest contained 60 per cent protein, in addition to relatively large quantities of vitamin B complex.

The taste of the liver protein digest is somewhat disagreeable, and a laxative effect was observed in some patients.

The liver protein digest supported positive nitrogen balance or nitrogen equilibrium when given as the chief source of protein to 5 normal subjects and 4 malnourished patients.

Plasma protein regeneration was demonstrated in 1 patient with nephrosis and in 1 with uncomplicated malnutrition, as well as in several patients with cirrhosis of the liver.

The results of the treatment of 19 patients with portal cirrhosis of the liver was at least as satisfactory as those attained with other means of supplying the many nutrients that have recently been advocated for the treatment of this disease. The recovery of 5 patients with infectious hepatitis progressed satisfactorily.

The liver protein digest proved to be an adequate protein supplement for 4 of 5 patients with severe thermal burns.

The digest was given to 3 patients with peptic ulcers, 2 of whom had marked pyloric obstruction. The results in these 3 patients were excellent.

Recovery in 3 patients with alcoholic peripheral neuritis who received the liver protein digest was approximately the same as was expected from the duration and severity of the condition.

Fourteen patients with malnourishment of various causes received the liver protein digest. Marked improvement was observed in 10.

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CONGENITAL DISLOCATION OF THE KNEE*

Report of a Case

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ALTHOUGH congenital dislocation is extremely rare, it is the most frequent congenital deformity of the knee. In recent years the occurrence and the treatment of this lesion have received considerable attention,[1–36] but to date an etiologic grouping has not been presented. It is the purpose of this paper to formulate an etiologic classification of congenital dislocations of the knee, to review the various cases reported to determine the incidence in relation to hereditary tendencies, sex and types of dislocations, to discuss the numerous treatments prescribed and to present the case of a patient treated by simple conservative manipulation and early physiotherapy and followed for a period of three years.

Many theories have been advanced regarding the cause of congenital dislocations of the knee.[16, 17, 26, 33, 36–50] Drehmann,[38] Mayer[37] and others[6, 39, 51, 52] believe that malpositions in utero are the primary causative factors, genu recurvatum and true dislocations being different only in severity. Hussein[2] and Kopits[10] consider mesenchymal defects the cause of multiple and universal abnormalities. McFarland[1] and others[12, 18, 28] believe the lesion to be due either to a primary defect or to malposition in utero. Magnus[40] and others[41–43, 45, 47–50] regard an intrauterine fetal illness as the cause.

In a determination of the etiologic factors involved, intrauterine or intrinsic causes and extrauterine or extrinsic causes must be considered. The former refer to dislocations arising from maternal or fetal intrauterine disturbances, and the latter to factors other than those related to maternal or fetal conditions, such as the necessary manipulations performed by the obstetrician during the process of delivery. The intrauterine or intrinsic causes can be divided into primary mesenchymal defects and traumatic developmental defects; the latter may be subdivided into developmental malposition in utero occurring during the developmental processes, secondary malposition in utero superimposed on a previously existing mesenchymal defect and malposition assumed during the actual process of delivery.

The severity of the condition seen at birth and the prognosis are dependent on the causative factor or factors involved. In the patients with primary defects, the lesions are usually multiple and therefore more difficult to treat, and the prognosis is necessarily based on the outlook for the other existing anomalies. In the traumatic group the lesions are usually single or bilateral, except for dislocations superimposed on a pre-existing mesenchymal defect, in which group multiple lesions are found. That this type can occur is shown by McFarland,[1] who reports a case in which x-ray findings before delivery revealed a fetus in utero with one leg flexed and the other hyperextended and in which other deformities were found at birth. The dislocations seen in the traumatic group when not complicated by other congenital deformities yield excellent results with simple conservative manipulation, provided treatment is instituted early.

A review of the literature reveals that neither familial nor hereditary factors truly influence the incidence of congenital dislocations of the knee. In addition, an attempt was made to determine whether or not acute maternal illnesses caused predisposition to the development of these congenital defects. It was noted that there was no relation between acute infectious diseases occurring in the mother during pregnancy and the development of this anomaly in the newborn. Of 212 patients whose cases were reviewed, a family history of a similar defect or some other congenital deformity was reported in only 7. In 174 cases the occurrence of acute maternal illnesses was denied. No mention of virus infections in the mother was made.

Against the belief of Muskat[41] and others[12, 28, 43] who state that these dislocations occur twice as often in girls, it was found that of the 212 cases of congenital knee dislocations, 101 appeared in males and 111 in females. It was also shown that the types of lesions were distributed about equally between the sexes. The types of dislocation included 155 cases of single dislocations and 57 of multiple deformities. Of the 155 patients in whom the knee was the only deformity noted, 95 showed unilateral and 60 bilateral dislocations. Of the 57 patients with multiple deformities, 31 presented unilateral and 26 bilateral dislocations of the knee. Kopits[10] observed that among 2393 cases of congenital deformity there were only 11 of dislocation of the knee as compared with 923 of congenital dislocation of the hip.

In congenital dislocations of the knees, the findings described by the various investigators[3, 6, 7, 9, 11, 21, 33] are essentially the same, and although the lesions are sometimes difficult to classify, the diagnosis is

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quite certain even without roentgenologic study. Hyperextension of the knee is often so marked that the lower leg is brought into contact with the thigh. The skin in front of the knee is slack and wrinkled, the patella being palpable but smaller than that of the opposite leg. Occasionally, the patella seems to be absent. The condyles of the femur and the tibial displacement are palpable, and the loss of flexion is obvious. When these findings are present, the diagnosis is established. In roentgenologic studies confirmatory evidence is offered, but it must be remembered that the joints are largely cartilaginous so that a clear picture of the relation of joint surfaces to each other cannot with certainty be obtained. In these cases, however, the angle and displacement between axes of the tibia and femur will be noted.

Early, conservative, manipulation of the knee is the most efficient method of therapy. In the majority of cases in which conservative treatment was instituted soon after birth, excellent anatomic and functional results were obtained. The longer the treatment is delayed, the more difficult the therapeutic procedures required and the less favorable the results. At a later period, surgical intervention is often necessary, and regardless of the treatment the reports show poor end results when compared with those in patients treated early.

The type of conservative method used differs depending on the surgeon. Essentially, the procedure consists of early reduction and maintenance of the reduced position followed by a gradual increase in flexion. When the patient begins to walk, a lateral knee brace or knee cage may be necessary.[54, 55]

Case Report*

A female infant, the head presenting, was delivered normally after 8 hours of labor. The birth weight was 7 pounds, 14 ounces. There was no family history of congenital lesions. Seven days after birth, except for the findings limited to the right leg, physical examination revealed a normal infant. The right leg was hyperextended. The skin over the knee was loose and markedly wrinkled. The tibia was anterior to the femoral condyles, the distal end of the femur projecting posteroinferiorly to the proximal portion of the tibia. The patella, located above the knee joint, was smaller than that of the left leg. There was laxity of the collateral ligaments.

On reflex action, the right lower leg was hyperextended on the femur to about 90 to 110°. From this point, the lower leg could be painlessly hyperextended to the thigh. Flexion could not be obtained unless traction was first applied to reduce the dislocation, when the leg could be straightened. Clicking of the knee joint was noted as the tibia passed over the distal end of the femur. The left leg was normal.

Treatment, which was started immediately, consisted of traction on the femur to reduce the dislocation. A malleable aluminum posterior splint was applied to maintain the position of the leg in 180° extension. On the 2nd day, the splint was removed, and flexion was increased, heat and massage being applied to the hamstrings and the quadriceps muscle. This procedure was repeated daily, allowing an increase in passive motion of flexion and extension to 180°. The attained position of flexion was maintained and increased by the use of the aluminum splint. Within 2 weeks, flexion was complete, but hyperextension was not allowed. Within 4 weeks, the splint was removed, and the knee did not dislocate. Although it was not deemed necessary to keep the splint applied, it was used 4 weeks longer, after which it was removed. During the manipulations no anesthesia was necessary.

On weight bearing, the leg appeared normal. After 3 years, examination of the right leg revealed no abnormal findings, and the child was able to run, play and jump as well as any other child her age.

*Reported through the courtesy of Dr. Daniel J. McSweeney.

Summary

An etiologic classification of dislocations of the knee is presented. The diagnostic features are discussed. The incidence of the condition in relation to sex, types and familial tendencies is described. The comparative results of various treatments are mentioned. A detailed case presentation is given.

In the treatment of congenital dislocations of the knee, the end results obtained are dependent on the etiologic factor involved and the time at which treatment is instituted. In patients with traumatic developmental lesions, excluding those with secondary malposition, early conservative treatment, even without anesthesia, results in normal anatomic and functional knee joints. In the presence of multiple lesions, the final outcome depends on the seriousness of the other congenital anomalies present. The necessary surgical procedures often used in the treatment of this lesion cannot compare with the results of early conservative therapy.

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MEDICAL PROGRESS

SYNTHETIC PLASTIC MATERIALS IN SURGERY*

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THE last thirty years have witnessed a tremendous growth in the plastics industry, and a great variety of new plastic materials have been developed. In the field of medicine they have been used chiefly in the production of surgical and medical diagnostic and therapeutic instruments. A limited application of plastic materials buried within the human body has been found, however, and it is with this use of plastics that this progress report is concerned. No attempt is made to review related medical fields, such as dentistry.

The selection of plastic materials for use in the body has been in large part fortuitous. Without previous laboratory trial, various plastics possessing certain desirable physical properties were employed sporadically in operative procedures. Some of these were well tolerated in the body; others were quite severe irritants to tissues. In more recent years, an increasing number of papers dealing with experimental surgery using plastics appeared. One plastic material, methyl methacrylate, was found to be well tolerated in the mouth by dentists, and was subsequently utilized by surgeons.

Certain general criteria should be met in the selection of any substance to be buried in human tissue. The material should be nonabsorbable and not modified by tissue fluids, chemically inert, free from excitation of early or late tissue reaction, nonepileptogenic when buried in brain tissue and noncarcinogenic. There are rare exceptions, but in general any solid plastic to be used in normal human tissue should satisfy these criteria.

Industry has developed literally thousands of varieties of plastic materials, and at first sight the wealth of information available is overwhelming. A careful selection of materials that fulfill specific surgical needs quickly limits the number of these substances that require investigation. Animal experimentation should be carried out to determine the reaction of individual materials in tissue before these substances are used in the surgery of human beings.

Sufficient experimentation has been done to warrant discussion of the following well known

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plastics: methyl methacrylate (Lucite and Plexiglas); "nylon," a generic term applied to a group of polyamides; vinyl resins (Vinylite); polyethylene (Polythene); and cellulose nitrate (celluloid) and regenerated cellulose (cellophane). It should be stated that on rare occasions plastic materials have been selected for use in the body because of their ability to set up a moderately intense reaction and to stimulate the formation of scar tissue. This subject is discussed below at greater length. Each of the plastics mentioned above is considered in a separate section of this report.

A brief account should first be given of the chemical and physical properties of plastics in general. A plastic is a solid material that contains as an essential ingredient an organic substance of large molecular weight and that, at some stage in its manufacture or in its conversion into end products, is capable of being shaped by flow.[1] The Plastics Materials Manufacturers Association has defined plastics as synthetic organic materials that, through application of pressure or heat, or both, may be fashioned into almost any desirable shape, varying from solids capable of fabrication by turning on a lathe to liquids that can be sprayed. Industrial plastics have been divided by Kline[2] into four categories: synthetic resins; natural resins; cellulose derivatives; and protein substances. It is not proposed to discuss the natural resins or the protein substances, since they are composed of complex chemical structures that are often not purified and have not been found suitable for use in tissues. Cellulose derivatives are primarily of historical interest, except for the isolated use of materials to stimulate scar tissue.

Interest is centered chiefly around the synthetic resins, many of which have simple chemical structures. The chemist has been able to synthesize materials that have the hardness of stone, the transparency of glass, the flexibility of rubber or the insulating ability of mica. In general, organic plastics are resistant to atmospheric and chemical corrosion and possess high structural strength, light weight, low heat conductivity and good electric-insulation value. The synthetic resins found most satisfactory for use in surgery are as a whole composed of long-chained polymers of simple monomeric structure. These have been converted into polymers by the influence of catalysts or by the effect of light, heat, oxygen or extreme pressure.

Synthetic resins are either thermosetting or thermoplastic. Thermosetting plastics are made extremely hard by heating, and their value in industry in general depends on this quality; this group has not been used in surgical procedures. Thermoplastic products are fusible, soften when heated and become hard again when cold.[3] The extremes of temperature variation in the animal or human body are not sufficient to alter the physical properties of any thermoplastic materials significantly. It is therefore with the thermoplastic synthetic resins that this paper is chiefly concerned, and the subsequent discussion centers around this group. Some of the plastics found useful in surgery are hard, and are employed because of that property; such a material is methyl methacrylate. Others, like polyethylene, are used because they are pliable and soft and are suitable for surgical application because they attain this softness through their own structure and not by the addition of plasticizers.

Most thermoplastic linear polymers of high molecular weight are hard, brittle solids at room temperature. On heating they soften and gradually become more flexible and plastic. The flexibility at room temperatures can be increased by the addition of materials of relatively low molecular weight, called "plasticizers." A great variety of plastic materials have been made available to industry by the use of such plasticizers.[4] Plasticization is essentially a separation of chain molecules by the plasticizer molecules converting hard plastics with long-chained molecules into pliable plastics with shorter molecules. Camphor, tricresyl-phosphate, glycerol and many other chemicals have been utilized as plasticizers. Plasticizers usually remain within the plastic material, and most of them have been found to be irritating to human and animal tissues.[5] It seems safest, therefore, to exclude from surgical usage all plastics that contain plasticizers, unless in the future varieties can be found that are not tissue irritants. This, of course, greatly narrows the field of potential plastic substances available to the surgeon.

Methyl Methacrylate

This long-chained polymer has been used more extensively and with greater success in both experimental and clinical surgery than any other synthetic resin. It is produced commercially under the trade names of "Lucite" and "Plexiglas" but is generally known as acrylic, particularly in the field of dentistry. In England it is frequently called "Perspex."

Methyl methacrylate is obtained by the polymerization of derivatives of acrylic acid. Under the influence of heat, light and such oxygen-yielding substances as hydrogen peroxide, the esters of acrylic acid and methacrylic acid polymerize through various stages to form methyl methacrylate.[6] This substance is considered to exist in chains of various lengths, formed by the linking together of the original monomeric molecules.

Methyl methacrylate can be cast in the form of sheets, rods or tubes, or it can be cast in a mold to any form desired. It has many advantageous physical properties. It is hard and tough, has high tensile strength, and is light, with a specific gravity of 1.18 to 1.20. It is chemically inert and stable, has negligible water absorption, is transparent, and has a high velocity resistance.[7, 8] It is nonporous, and its surface is impervious to the ingrowth of bacteria; hence, it is easily sterilized. It has been found to

be nonabsorbable in human tissues and unchanged when buried in them. It retains its form and does not begin to soften until heated above 150°F. In repeated reliable experimental and clinical studies, it has been shown to be well tolerated in both animal and human tissues.

Mackenzie, Sharpless and Millard[9] performed animal experiments to compare the reaction of tissues to vitallium, ticonium and acrylic. Histologic studies were done at intervals, and photomicrographs are published in the paper. Acrylic was found to cause no inflammation whatever. A thin, fibrous, tissue membrane that became increasingly dense over a six months' period formed around the material. Vitallium and acrylic were tolerated about equally well in the short series of experiments; ticonium was less satisfactory.

Beck et al.[10] buried disks of acrylic in the skulls of rabbits. They used 16 animals, in half of which they removed the dura under the disk, and sacrificed the animals at intervals up to seven months. The plastic was well tolerated, being surrounded by a thin, fibrous, tissue capsule, to which it was not adherent. In some animals in which the underlying dura had been removed there were mild adhesions between the thin fibrous capsule and the leptomeninges, but the brain was normal in all. The photomicrographs showed no evidence of foreign-body reaction to the acrylic, which was considered to be well tolerated.

Woolf and Walker[11] also presented photomicrographs of acrylic buried in tissues over a prolonged period in which the plates were encapsulated by a thin layer of connective tissue. Acrylic did not incite any foreign-body reaction even in the presence of wound infection. This has been borne out clinically by Elkins and Cameron,[12] who reported 70 cases of cranioplasty in combat wounds of the head. They found no complications attributable to acrylic; some of their plates had been in place two years. In one case in which infection occurred, the plate was not removed, and the wound subsequently healed satisfactorily. There are other scattered reports of the effect of acrylic on tissues. Penhale[13] buried acrylic in the subcutaneous tissues of monkeys for seven days. Reproductions of the histologic sections showing the slight reaction that occurred were published. The reaction was much less than that caused by cartilage or ivory. Penhale reported several patients who had had implants in place for the correction of facial deformities for over three years without complications.

Burman[14] and Burman and Abrahamson[15] describe methyl methacrylate as reactionless; gross and microscopical studies of the subcutaneous tissue of rabbits after implantation of the material showed no reaction after eighty days. They performed three arthroplasties using this material with satisfactory results. Dennis[16] observed that Lucite caused no significant reaction in the muscle of a dog after thirty days. Davis[8] states that the acrylic used in protecting helmets for airmen causes no unfavorable reaction if accidentally driven into tissues.

Spealman and his associates[17] studied the toxicity of methacrylates by oral, intraperitoneal and subcutaneous administration and by inhalation. The monomeric form was mildly irritating, but in the final polymeric form the acrylic showed no irritation and no tendency to sensitize animals. Implantation in subcutaneous tissues of mice provoked no tumor growth.

The medical literature on this particular synthetic resin is more extensive than that on any other. The material has been adequately tested and found suitable for a variety of surgical uses, some of which have also been reviewed by commercial publications.[18]

Methyl methacrylate is admirably suited for the repair of defects of the skull. As suggested by Woolf and Walker,[11] nonmetallic alloplastic grafts for skull defects should fulfill certain criteria: they should be inert and not modified by tissue juices; they should not be epileptogenic or carcinogenic; they should be sufficiently rigid to maintain contour; they should offer little or no resistance to x-rays; and they should cause little or no immediate or late tissue reaction. Methyl methacrylate meets these standards adequately, and a number of reports of its use in cranioplasty attest its value.

The article of Elkins and Cameron[12] mentioned above presents the largest reported series in which acrylic was employed. Woolf and Walker[11] considered it one of the most satisfactory materials for cranioplasty. Gurdjian, Webster and Brown,[19] Lambros,[20] Woodhall,[21] Kahn[22] and Kerr[23] describe methyl methacrylate as a satisfactory material for cranioplasty. Small and Graham[24] recently reported the use of methyl methacrylate for the closure of skull defects in 25 patients. They had only one failure, in a patient in whom there had been a previously infected subdural hematoma. Their paper, profusely illustrated, describes in great detail the technic of forming and inserting the plates.

The acrylic plates are made by the impression technic, which requires either a two-stage procedure or a delay of about one and a half to four hours during an operation while the plate is being formed. Its use is somewhat more complicated than that of tantalum, but because it is not opaque to x-rays and can be fashioned somewhat more satisfactorily to obliterate dead spaces in tissue, it is probably superior to that material for cranioplasty in most cases. Acrylic is considered easier to use than vitallium. Since it is widely employed in dental laboratories, the co-operation of a dentist in any large hospital facilitates its use.

One of the strongest objections to methyl methacrylate for cranioplasty is the time required to form the plates. Shoreston[25] has circumvented this draw-

back in small skull defects by the use of preformed acrylic plates of various sizes, which he put in place at the time of the primary operation. He used these only in patients without neurologic deficit and in those in whom the dura was intact. He reported 48 cases in which this technic was employed.

Blum[26] refers to another method of speeding up the process of polymerization of methyl methacrylate. This is done by the addition of a special catalyst, whose composition is not given, to the methyl methacrylate "dough." The material is exposed to ultraviolet rays, and the process of polymerization requires only fifteen minutes. Blum stated that the substance did not produce dural reaction or changes in the underlying brain tissue. The same method is mentioned in a later publication[27]; in addition, reference is made to the fact that methyl methacrylate sheets can easily be molded at 130°C. If rapidly cooled, they will retain the shape into which they have been molded and can be boiled or autoclaved. These methods will contribute significantly to shortening the operating time in cranioplasty with methyl methacrylate.

Acrylic has been used in several other areas of the body to replace the metallic alloy, vitallium. It is considered by some to be ideal for arthroplasty, particularly in arthritis of the hip. Harmon[28–31] has described the use of acrylic in hip arthroplasties in several reports and is enthusiastic about the results. In his last report he had done hip operations with acrylic cups in 16 cases. The results were excellent in 62 per cent, good in 19 per cent and poor in 19 per cent. He believed that the poor results in 2 of 3 cases were due to error in selection of cases. The relief of pain in arthritis of the hip was reported as dramatic in many of the cases. Burman and Abrahamson[15] employed acrylic in arthroplasty of the hip in 1 case and of the finger in 2, with good results.

Methyl methacrylate has also been used in plastic surgery for sculpturally molded implants in facial deformities, as described by Brown[32] and by Penhale.[13] It has been implanted in the scrotum in patients who had had previous orchidectomies.[33] In addition to being light and well tolerated in the scrotum, the implants provided considerable cosmetic improvement and psychologic comfort. After a year in place, they showed no evidence of unusual tissue reaction to gross palpation.

Dennis[16] implanted specially formed methyl methacrylate tubes into cavities of the long bones of patients with chronic osteomyelitis. He reported that the tubes stayed in place twelve to fifteen months and were well tolerated, and that satisfactory healing of the chronic infections took place as a result of this procedure.

In the field of experimental medicine, Sohler, Lothrop and Forbes[34] first made use of Lucite windows screwed into the skulls of animals with the acrylic in contact with the brain. These were employed to observe the circulation of blood over the cortex for a period of many weeks without the occurrence of infection. An excellent elaboration of this technic has been described by Shelden et al.[35] who were able to fashion a transparent Lucite calvarium covering the entire top of a monkey's head. This was held in place with screws. Several of the coverings were left in place for many months. This type of experiment offers an exceptional opportunity for observing the surface of the brain under essentially normal conditions of intracranial pressure and cerebral circulation. Owing to the lack of reaction to methyl methacrylate, the scalp edges around the base of the plate healed rapidly and showed no infection.

Merendino and Litow[7] fashioned gastrostomy tubes that could be maintained in position in experimental animals for several months. They suggested the use of this material for gastrostomies in human beings but did not report any such cases.

A little known property of methyl methacrylate is that described by Hirschboeck,[36] who found that tubes and small containers made of methacrylate possessed an anticoagulant power that he believed to be due to the pronounced water-repelling property of the surface of the material. The coagulation time in Lucite tubes is approximately twice as long as that in glass. The application of this property to the use of acrylic in vascular surgery suggests itself. Brief reference to this possibility is made by Mustard,[37] although he refers to no specific type of plastic material.

Hufnagel[38] performed a series of anastomoses of the thoracic aorta in 18 dogs after resecting 1 to 3 cm. of the aorta. He used tubes of methyl methacrylate 4 cm. in length and 1.0 to 1.3 cm. in diameter, with walls 1 mm. thick, to bridge the gap. Particular care was taken to polish the inner wall of the tubes so that there were no rough areas or irregularities. These tubes were tied in place with two braided-silk sutures at each end of the tube. Six dogs died of hemorrhage seven to ten days after operation, owing to cutting through of the suture, but this was obviated in later experiments by the use of a coarser braided-silk suture that gave multiple point fixation. The striking result of these experiments was that thrombosis did not occur in a single animal either in the tube or in the aorta. Some of the animals lived as long as six months in excellent health.

DeBakey and Simeone,[39] in a discussion of the treatment of arterial injuries in battle wounds of 2471 soldiers in World War II, mention the occasional use of plastic tubes in vascular anastomosis. They found records that this method had been used in 14 cases, but the type of plastic employed was not mentioned. The results, which were not recorded in individual cases, were discouraging in general. The authors believed that blood was

likelier to clot rapidly in plastic tubes than in vein grafts for vascular anastomosis, although the use of plastic tubes, if satisfactory, would be a simpler technical method.

Edds[40] published a description of a method of preventing neuroma formation in severed peripheral nerves by coating the proximal end of the nerve with a 10 per cent solution of methyl methacrylate in acetone. This was successful in the nerves of rats up to a diameter of 1.5 mm., but it was not applied extensively to larger nerves. It was suggested that to make the procedure effective in larger nerves, the epineurium must be retracted from the end of the nerve before the acetone and methacrylate are applied.

Nylon

"Nylon" is a generic term applied to a large family of related chemical compounds and not to a single pure product. This large group of chemical compounds consists of polymeric amides whose molecular structure is made up of alternate groups of NH-CO and CO-NH with a variable number of interposed methylene groups.[41] Chemically, they resemble natural proteins. Nylons are used widely as filaments to fabricate a variety of products, such as stockings and parachutes. They are thermoplastic, and although they soften at a higher temperature than most thermoplastic substances, they can be readily extruded or molded into various forms. It is in the form of a filament that nylon plastics have been utilized in surgery, specifically in the form of suture material.

Since the term "nylon" refers to a large group of chemically related but structurally different compounds, it is obvious that to discuss the use of nylon in surgery, one should know exactly what chemical compound is used in each product so labeled. This is difficult because, as in some other plastics discussed below, commercial secrets prevent general knowledge of the detailed composition of individual products. In practice, nylon in the form of filaments of various sizes is supplied to medical supply houses, which take the responsibility of dispensing the material in desirable forms. They also take the responsibility of furnishing to those who use the material a nylon filament that by previous experimental study has been found suitable. Whether one medical supply house dispenses nylon sutures identical with those dispensed by any other supply house is not known. The same criticism might be leveled against catgut, silk or cotton, whose exact structures surgeons do not know but which are used because the same product has been found satisfactory year after year.

Nylon, using the term as applied to surgical suture material, is odorless, tasteless and resistant to most chemicals, and withstands repeated autoclaving without weakening of its innate toughness and elasticity. It does not deteriorate significantly with age, is not absorbed when buried in human or animal tissues and is extremely strong. A strand of nylon compared to a strand of silk of the same size has been found by Nichols and Diack[42] to be stronger, more elastic and more resistant to moisture absorption.

Nylon can be supplied as either a monofilament or a braided suture. Melick,[43] Haxton[44] and Aries[45] have reported studies comparing the two forms of suture. It seems generally agreed that the monofilament causes slightly less tissue reaction than the braided form of multifilament material, but is harder to handle and more difficult to tie in knots that will not slip. In point of fact, the criticism of slipping of knots tied with nylon has been directed against the braided form as well as the monofilament. Unless sutures are tied carefully, particularly with the larger sizes of nylon, there seems to be more tendency to slip than when silk sutures are used.

Clinical trials of nylon as a suture material have appeared in the literature in reports by Stonham,[46] Haxton[44] and Burman.[14] All these authors have recommended nylon as superior to silk or any other suture material for general use.

Experimentally, adequate studies of nylon as a suture material have been made by several investigators. Melick[43] reports that in the early stages of healing there is more reaction around nylon multifilament sutures than around silk but that the final result is the same, neither suture material showing any significant tissue reaction compared to that caused by catgut. Aries[45] observes that nylon causes less reaction than silk and that in infected wounds, leukocytes are found around silk longer than around nylon. Nichols and Diack[42] state that the reaction to silk and nylon is about the same, but they favor the latter because of its greater tensile strength.

It is not known whether these various workers, who obtained the material with which they experimented from different supply houses, employed the same chemical product, but their results agree so closely that one can only conclude that there is minimal tissue reaction to the nylon sutures generally used. In an extensive study of wound healing, Localio, Casale and Hinton[47, 48] tested the strength of wounds in rats sutured with catgut, cotton, steel-alloy wire, silk and nylon. They found nylon equal to cotton, steel wire, and silk, and better than catgut. Their figures indicated there was slightly more rapid firm union with nylon than with any of the other sutures, but the rate of healing with all the nonabsorbable sutures tested did not vary enough to be statistically significant.

Burman[49] has reported a series of 4 cases of arthroplasty of the small joints of the finger with so-called "parachute nylon" as an interposition membrane. Only 1 of the cases was reported in detail, and the patient was considered greatly im-

proved. Burman believed that nylon used in this way caused a certain amount of serous fluid to collect around it, a property that he regarded as desirable in this operation.

Weiss and Taylor[50] employed multiple fine strands of nylon to aid in bridging nerve gaps in experimental animals. By an ingenious technic worked out by them, the gap between the nerve ends is bridged by the nylon fibers and filled with solid blood clot. This is covered by collagen or some other sheath to prevent the ingrowth of scar tissue. Weiss and Taylor considered that the nylon fibers, by producing linear areas of liquefaction through the blood clot, provide orienting pathways across the gap for the regenerating nerve fibers and thus prevent whorling and neuroma formation. Their method has met with success in smaller animals, rats and cats.

Vinyl Resins

The use of plastics referred to as "Vinylite" is occasionally reported. This is one of the trade names employed to describe a variety of manufactured products varying from polyvinyl alcohol to a polymerized mixture of vinyl chloride and vinyl acetate. These substances are often mixed with a plasticizer to give them pliability, and an almost limitless number of materials can be compounded under the term "Vinylite." Few reports of the actual use of vinyl compounds within the body have appeared. It would be only a coincidence if two investigators used the same chemical compound, since this product is a highly variable one.

Bailey and Ford[51] report that a Vinylite compound buried in the abdominal wall of guinea pigs caused only slight tissue reaction. MacQuigg[52] used a vinyl chloride polymer in the form of a tube for prolonged intramuscular injections. Such tubes were left in place up to four days without apparent reaction. Narat and Cipolla[53] found that a vinyl derivative called "Tygon" inactivated penicillin when kept in contact with it for twenty-four to seventy-two hours. There was a 38 per cent deactivation of the penicillin in seventy-two hours, and the same inactivation was observed with rubber tubing. It was suggested that either this material not be used for the administration of penicillin or that the dosage given through it be correspondingly increased. Whether shorter periods of contact between the tubing and the penicillin deactivated the latter was not recorded.

The vinyl compounds have found extensive use in the formation of prostheses in plastic surgery[54, 55] and in forming protective layers over the skin, as around ileostomies and colostomies.[56] There is a reasonably large group of papers on this phase of the subject, but since this is not strictly related to the use of plastics within the body, no effort has been made to review this literature.

(To be concluded)

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

Weekly Clinicopathological Exercises

FOUNDED BY RICHARD C. CABOT

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CASE 33101

PRESENTATION OF CASE

A forty-seven-year-old housewife entered the hospital complaining of pain along the left costal margin.

Nine weeks before admission the patient had consulted a physician because of fatigue, swelling of the feet and ankles, vomiting and epigastric pain. The pain was intermittent, usually occurring after fatty or fried foods or cabbage had been eaten. It was sharp, lasted a few minutes and was most marked at the left costal margin, occasionally radiating medially into the epigastrium. It was aggravated by inspiration and by the attacks of vomiting, which usually occurred once a day about thirty minutes after a meal. The patient was given digitalis and sent home to bed. During the following week the ankle swelling subsided, but the other symptoms persisted. Seven weeks before admission a fibrous, contracted gall bladder containing a single stone was removed at another hospital. Ten days later the patient felt a sharp pain in the left lower chest and developed dyspnea and physical and x-ray signs of consolidation of the left lower lobe of the lung. The temperature and pulse were elevated. The symptoms persisted despite penicillin injections. Seventeen days before entering the Massachusetts General Hospital, she went home against advice. At home she felt feverish and anorexic, but noted no chills, petechiae or edema.

At the age of fourteen years an attack of fever and joint pain had kept the patient in bed about four weeks. At the age of thirty-seven she underwent a hysterectomy.

Physical examination revealed the patient to be pale and apparently acutely ill. The tongue was red and smooth, and the skin rough and dry. The apical beat was regular at a rate of 110. A Grade I systolic and a questionable presystolic murmur were heard at the apex. There were dullness, decreased breath sounds and decreased tactile fremitus at the base of the left lung posteriorly. The entire right side of the abdomen felt resistant. At the upper pole of the vertical scar in the right upper quadrant there was a draining sinus. An old healed scar occupied the midline above the symphysis. There was slight pitting edema of both ankles.

The temperature was 99.6°F., the pulse 105, and the respirations 26. The blood pressure was 140 systolic, 70 diastolic.

Examination of the blood disclosed a red-cell count of 2,400,000, with a hemoglobin of 10 gm. per 100 cc., and a white-cell count of 21,000, with 82 per cent neutrophils and 16 per cent lymphocytes. The specific gravity of the urine varied between 1.008 and 1.011. The urine gave a +++ to ++++ test for albumin, and the sediment contained innumerable granular casts but no cells. The blood nonprotein nitrogen was 41, the phosphorus 5.5 and the sugar 88 mg. per 100 cc.; the total protein was 6 gm. per 100 cc.. with an albumin of 2.45 and a globulin of 3.55 gm., and the carbon dioxide 24.2 milliequiv. per liter. An electrocardiogram showed a rate of 138, with a PR interval of 0.18 second, slurred QRS complexes, sagging ST segments in Leads 1, 2 and 3, diphasic T waves in Leads 2, CF_2 and CF_4, inverted T waves in Leads 1, 3 and CF_5 and sagging ST segments in Leads CF_2, CF_4 and CF_5. On x-ray examination the heart was somewhat globular, and the cardiothoracic ratio was 12.5:26.0. On the left the posterior portion of the diaphragm was elevated, and there was a hazy area of increased density in the left side of the chest posteriorly, with a few linear areas of increased density extending upward obliquely from the diaphragm. A barium meal demonstrated slight deformity of the antrum and prepyloric area and enlargement and deformity of the duodenal cap without ulceration. In the intravenous pyelogram the kidneys appeared large. The dye was poorly excreted, and only on the right were faintly outlined calyxes visible. There were several calcified nodules opposite the third lumbar vertebra.

In the hospital the patient was lethargic and almost constantly nauseated, appearing far sicker than the temperature or the nonprotein nitrogen warranted. All food was vomited. A duodenal tube was inserted, but vomiting continued, varying

in amount from 250 to 1300 cc. daily. The urinary output ranged between 750 and 250 cc. daily.

Retrograde pyelogram on the twelfth hospital day showed nothing unusual. The urine was sterile on admission, but later a moderate number of and abundant colonies of colon bacilli were grown respectively from the right and left ureteral specimens. On the fifteenth day a bromsulfalein test showed 22 per cent retention of the dye after forty-five minutes. With the constant vomiting the patient's condition grew worse. A questionable pericardial friction rub was heard. The temperature ranged between 99 and 100°F. during the entire admission. The patient was found dead on the twentieth hospital day.

Differential Diagnosis

Dr. Earle M. Chapman: May I see the x-ray films?

Dr. Richard Schatzki: So far as the kidneys are concerned I should say that in the intravenous pyelogram they are a little enlarged. Some of the films show a small amount of dye in the kidney pelvis. The surprising thing to me about the intravenous pyelogram is that there is any dye visible with specific gravities of the urine of only 1.008 and 1.011. The retrograde pyelogram shows that the kidneys are normal in size and shape. The area of calcification mentioned is on the left side and shifts around inside the abdomen. The chest shows a small area of either atelectasis or scar in the posterior lower aspect of the left lower lobe, with a small amount of fluid in this area. The few stomach films that we have show a deformity that is by no means characteristic, and I thought that it would be wise to look at the x-ray report made at that time and found that the examination had been unsatisfactory. The examiner could see the patient only in the horizontal position. The deformity involves the antrum as well as the immediate postpyloric region. I cannot see any tumor mass in the stomach, nor can I be sure whether or not there is an ulcer present, but my impression, along with that of the fluoroscopist, is that no ulcer is visible.

Dr. Chapman: I think that you will agree with me that this is, indeed, a case in which it is going to be difficult to come out with a diagnosis that covers the syndrome. There are one or two questions that I think fair to have answered from the record. It seems to me that there must have been some comment during a nine-week illness whether this woman's bowels moved, especially while she was in the hospital.

Dr. Tracy B. Mallory: They did.

Dr. Chapman: And I should like to take a quick look at the electrocardiographic tracings. The ST segments in all leads were sagging, and the T waves in Leads 1 and 3 were inverted. I am looking also at the P waves to see if they were inverted; since the right and left arm electrodes may have been mixed it could have been a technical error.

We can discuss first the more probable diagnoses in this patient and then those that are speculative and put them together to try to explain this woman's death in renal failure, with a low nonprotein nitrogen. It is stated in the record that she appeared far sicker than the temperature or the nonprotein nitrogen indicated. Indeed she was. She died without any indication of the true diagnosis by the laboratory and other investigative procedures.

The patient had had rheumatic fever; that brings up the question, Did she have rheumatic heart disease and attendant disorders? I believe that there is not enough evidence in this record to establish rheumatic heart disease or heart failure in the final illness as having been responsible for death. At the age of thirty-seven the patient had a hysterectomy—in other words, injury to the pelvis of a surgical nature. X-ray study revealed an area of old calcification, although its duration was not known, lying apparently on the left side in the region of the left kidney. That suggests an old healed tuberculous lesion of many years' duration.

We then come to the illness of nine weeks' duration characterized by weakness, edema of the lower extremities, severe nausea and finally almost constant vomiting. The gall bladder had been removed for these symptoms, but I believe that this was an unnecessary operation — it was done in good faith but did not relieve the patient. It was following this that she had the first episode that I believe was the first clue to what was wrong. I interpret these signs and the sudden onset of pain in the lower left chest as having been due to a large pulmonary infarction. Indeed, we know that the first pulmonary infarct usually slithers into the left lower lobe; it has been pointed out by Allen, Linton and Donaldson[1] that 70 per cent are found in the left lower lobe. In support of this diagnosis is the persistence of the physical signs despite the treatment with penicillin, which was given on the basis, I suppose, of infection. In further support, I think that the electrocardiographic changes were similar to those that are seen in the presence of pulmonary infarction. They were not entirely typical because in acute pulmonary infarction changes in the S waves are described. This tracing is abnormal but not diagnostic of any particular type of heart disease, although it does suggest obstruction of the pulmonary artery.

The final consideration is the renal failure. What type of renal failure was this? Why did the patient die in this peculiar manner? I think that the presence of large kidneys demonstrated by Dr. Schatzki excludes glomerulonephritis or any other type of chronic process. I cannot believe that this was amyloid disease because no chronic infectious process was demonstrated. Immediately, one wonders if at operation done outside this hospital some form of sulfonamide was dusted into the wound, whether this was a sulfathiazole reaction in the kidney, and whether these were toxic kidneys.

A more probable explanation and one that seems to fit is that this woman had extensive thromboses in the venous channels leading up into the abdomen, finally going past the left renal vein, which is the lower tributary, and finally involving the right renal orifice. What supports this extremely rare diagnosis? She had renal failure, with large kidneys, anemia, fixation of the specific gravity, the presence of a large amount of albumin, granular casts, a high blood phosphorus and a high nonprotein nitrogen — I assume that the nonprotein nitrogen rose later on.

Dr. Mallory: It subsequently went to 54 mg. per 100 cc.

Dr. Chapman: The record states that the patient was vomiting and excreting between 750 and 250 cc. of urine. We know that a fall in the urinary output below 500 cc. is not compatible with long life. In fact, when the output falls below 500 cc. a day few people can survive longer than ten days. At the end a pericardial friction rub developed, which is typical of patients dying in uremia. Along with this a test of liver function showed 22 per cent retention of the dye. My interpretation of this test is that there was an extensive toxic liver injury from venous thrombosis.

All through the record it states that the patient was vomiting, and an attempt was made to diagnose some disease of the gastrointestinal tract, either ulcer or obstruction, and yet apparently she did not have either. One clinical sign was pointed out to me by Dr. Schatzki years ago — namely, that in patients who have severe nausea, along with vomiting, one should look for the primary disease outside the digestive tract. I think that that may have been true in this case. The patient had severe nausea and vomited continuously, and yet all the studies failed to reveal disease in the digestive tract and she did not have obstruction because the bowels moved while she was in the hospital. But what was the source of the nausea?

There is one other point that I should refer to — namely, the signs over the left lower lobe, which I attributed to pulmonary infarct.[2] The record states that there were dullness, decreased breath sounds and decreased tactile fremitus at the left base; these signs would also fit with a process causing occlusion of the bronchus — in particular, carcinoma. There could have been cancer within the abdomen, either primary or secondary to this lesion, but I think that that is an unlikely diagnosis and mention it only in passing.

In conclusion, I believe that this patient had had rheumatic fever—but not rheumatic heart disease—and no evidence of congestive heart failure. She had had a previous operation on the pelvis. She had calcification in the abdomen suggesting old tuberculous lesions and finally an illness with swelling of the legs, nausea and vomiting that led to death within nine weeks and during which the gall bladder, which I believe was not the cause of the illness, was removed. The only way I can explain the whole picture is by extensive venous thrombosis leading higher and higher, reaching the level of the tributaries of the renal veins and thus giving the picture of a terminal renal failure.

Dr. Schatzki: I may have given the wrong impression about the deformity near the pylorus. I do not know what it is from the film, but I think that there is something definitely wrong there and it may have been produced by ulceration, although no ulcer is demonstrable now.

Dr. Chapman: I interpret the changes as probably having been due to manipulation in that area during the gall-bladder operation.

Dr. Schatzki: If that is true the reaction is the most unusual one that I have seen.

Dr. Chapman: There are no signs of obstruction?

Dr. Schatzki: Not on the film; and the x-ray report does not mention it.

Dr. Chapman: That was a point I tried to clear up.

Mr. James H. Austin: With obstruction of the inferior vena cava, would you not expect the red-cell count to be higher, and how do you explain the bromsulfalein test that is recorded?

Dr. Chapman: I do not believe that the patient had independent liver disease. That test was late in the course. She died of renal failure, and that was part of the general toxic picture.

Dr. Lewis W. Kane: Could the x-ray film be interpreted as showing a lesion in the pancreas?

Dr. Schatzki: I do not believe so. Offhand, I should say that the lesion was most probably due to a former ulcer.

Clinical Diagnoses

Chronic nephritis.
Uremia.

Dr. Chapman's Diagnoses

Injury from pelvic operation.
Calcified tuberculous nodes: left abdomen.
Extensive venous thromboses: ascending vena cava.
Pulmonary infarction: left lower lobe.
Renal failure from venous obstruction.

Anatomical Diagnoses

Subdiaphragmatic and subhepatic abscess, secondary to cholecystectomy.
Acute lipoid nephrosis.
Fatty vacuolization of liver.
Healed tuberculosis of spleen.

Pathological Discussion

Dr. Mallory: The trouble was not above the diaphragm, as Dr. Chapman suggested on the basis of pulmonary infarcts, but beneath it. There was a large subdiaphragmatic abscess, and the only thing we found in the pleural cavity was fairly dense pleural fibrosis at the base. There were no pulmo-

nary emboli. There was a localized peritonitis in the lesser peritoneal cavity, but we found nothing intrinsically wrong with the stomach or duodenum. The posterior surfaces of both the stomach and the duodenum were bathed in pus from this localized peritoneal abscess. The kidneys, as Dr. Schatzki predicted, were enlarged. Microscopically they showed a rather extensive fatty vacuolization of all the proximal convoluted tubules — a lesion that is consistent with the severe albuminuria that this patient had. The liver also showed rather marked fatty vacuolization, particularly at the periphery of the lobules — the type of vacuolization that is seen in patients with starvation; it might be attributed to the vomiting for a period of several weeks.

DR. CHAPMAN: Were these changes consistent with amyloid disease in the kidneys? I mentioned that as possibly occurring secondary to an infection.

DR. MALLORY: There was no amyloidosis. Anatomically, we must call this lesion lipoid nephrosis, although the clinical picture was somewhat unusual.

DR. CHAPMAN: How about the heart?

DR. MALLORY: It was entirely normal, weighing 260 gm. There was a calcified tuberculoma of the spleen.

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CASE 33102

PRESENTATION OF CASE

A twenty-eight-year-old Italian housewife was admitted to the hospital because of easy fatigability.

The patient stated that she had felt tired for three weeks. This fatigability was associated with some dizziness, occasional faintness and nausea and vomiting. She had had no cough; the menstrual flow had diminished recently, and she had missed one period. She had had no other vaginal bleeding.

Because of rheumatoid arthritis she had been admitted to this hospital seven years previously and had subsequently been followed in the Out Patient Department. Four years before the previous admission an appendectomy and a removal of an ovarian cyst had been performed in another hospital.

Physical examination revealed a thin, pale woman with spindling of most of the fingers and thickening of the tissues around the right knee. The blood pressure was 105 systolic, 45 diastolic, and there was a Grade I systolic murmur at the apex.

Examination of the blood disclosed a red-cell count of 2,000,000, with a hemoglobin of 5.8 gm. and a hematocrit of 20, and a white-cell count of 2800, with a normal differential. The urine was normal. Several stools were guaiac positive. A gastric analysis revealed no free hydrochloric acid either before or after histamine, with 5 units of combined acid in each specimen. Plain films of the chest and abdomen were normal.

Two days after admission the white-cell count rose to 5500, without change in the red-cell count. A gastrointestinal series and barium enema were negative except for slight deformity of the stomach opposite the incisura, somewhat suggestive of an ulcer on the posterior wall. A blood count done shortly after admission revealed 4.5 per cent reticulocytes. Liver-extract therapy was instituted two weeks after admission, and three days later the reticulocytes had risen to 6.6 per cent. On the fourth and fifth days, however, they had fallen to 4 and 3 per cent respectively. The red-cell count rose slowly, and about three weeks after admission it had reached 3,200,000, with a hemoglobin of 9.5 gm. Because of the deformity of the stomach visible on the x-ray film, a gastroscopic examination was done about two weeks after admission, revealing normal peristaltic waves and a normal pylorus. Throughout the body of the stomach, from just distal to the angulus almost to the cardiac orifice, involving the lesser curvature, posterior wall and greater curvature, the rugae were unusually thick and tortuous and presented a definitely rigid appearance, with some areas of reddening and some mucosal hemorrhage. These folds did not flatten by air inflation. Along the greater curvature and posterior wall the mucosa had a verrucous appearance. The anterior wall appeared essentially normal except for reddening. There was no blood in the stomach, and no ulceration or erosion.

Approximately a month after admission an operation was performed.

DIFFERENTIAL DIAGNOSIS

DR. BERNARD JACOBSON: We are told that this young woman had had definite rheumatoid arthritis at least seven years previously and that when admitted to the hospital she had deformities consistent with long-standing rheumatoid arthritis. From this point on, however, I shall give no further thought to the rheumatic condition; I do not believe that it was related to the present disease. We are not told whether she noticed melena. This is interesting but does not rule out a history of bleeding before admission. Of course, the symptoms of dizziness, faintness and easy fatigability are common to many diseases. In this case we can readily ascribe them to the nonspecific effects of anemia in general. We are told that the patient had missed one menstrual period. We are not told anything about the results of a pelvic examination. In view of this I shall assume that the pelvic examination was essentially negative and that the patient was not pregnant. Any severe anemia can temporarily produce amenorrhea. At the time of admission the blood pressure was 105 systolic, 45 diastolic — a rather low pressure that is consistent with the evidence of anemia.

The same thing holds true for the Grade I systolic blow at the apex. From the description of the blood counts it is obvious that this was a normocytic, normochromic anemia. We are told that the initial white-cell count was 2100, with a normal differential. We are further told that two days later the white-cell count rose to 5500. I rather discount the rise. I prefer to say that the white-cell count on admission was 2800 and two days later was found to be 5500. Accepting the statement that the differential count was normal and that there were no significant changes in the platelets or in the morphologic structure of the red cells, I think that we are forced to call this a nonspecific, simple type of anemia. We can fairly well rule out leukemia, although not completely. We can also rule out thrombocytopenia.

The roentgenologist's suggestion of an ulcer on the posterior wall of the stomach is important. It brings to mind a patient whom I followed some years ago with frank classic Addisonian pernicious anemia. He had no symptoms during four or five years of maintenance treatment, and then developed digestive symptoms that led to gastrointestinal studies; the report of the x-ray series was similar to that in the case under discussion, with the suggestion of an old healed ulcer. I am sorry that I did not evaluate the interpretation properly at that time. Instead of advising the patient to come to the hospital immediately I dillydallied, and three or four months later he presented himself with an inoperable adenocarcinoma. The fallacy of my reasoning, I hope, will not be repeated again; a patient with pernicious anemia and a patient with a long-standing achylia gastrica should never be given a diagnosis of ulcer. Something else should be suspected.

In the case under discussion, in view of the roentgenologic findings, we must definitely look for something other than ulcer in the patient's stomach. Apparently the service was of the same opinion.

Before liver was given the reticulocyte percentage was 4.5, which is definitely above normal. In view of the other findings I shall ascribe that to recent mild or moderate hemorrhage. Since we are told nothing about jaundice or yellow scleras, I assume that this was not a hemolytic anemia with a high reticulocyte count. The fact that a slight increase in reticulocytes occurred a few days after liver extract had been given has no significance. There is nothing in the abstract to suggest liver-deficiency anemia.

We are told that three weeks after admission the red-cell count was 3,200,000, with a proportional hemoglobin. This rise was undoubtedly consistent with the possibility that acute hemorrhage from the stomach had ceased and that a normal regenerative process was going on. Several years ago an interesting series of articles by a man named Schiodt* in Copenhagen pointed out that a rise of the hemoglobin and the red-cell count in regeneration from bleeding peptic ulcer is similar to the elevation following the administration of liver extract in pernicious anemia and to that in hypochromic anemia after the administration of iron. In other words, the physiologic capacity of the bone marrow for regeneration is fairly uniform, and one can expect a person with normal bone marrow who stops bleeding to regenerate the blood as rapidly as a patient with pernicious anemia after liver extract.

Gastroscopic examination showed an area of submucosal hemorrhage. So far as I can see, this was a diffuse infiltrating lesion in the submucosa. It was entirely different from the atrophic, thin mucosa of pernicious anemia. There was nothing in the history to suggest alcoholic gastritis or other causes of severe hypertrophic gastritis.

Again assuming that the blood serologic findings were negative, we can probably dismiss syphilis of the stomach. We are therefore faced with a tumor of the stomach. In view of the extensive appearance of the gastroscopic findings I believe that this was not a benign but a malignant tumor of the stomach. The age — twenty-eight years — is not against the finding of such a tumor. The type of anemia, a simple normocytic normochromic anemia, is perfectly compatible with it. So far as the nature of the tumor is concerned I do not believe that it is in the province of anyone but the pathologist to tell. Lymphosarcoma is a good possibility in a woman of this age, if the tumor was an infiltrating carcinoma. Even leiomyosarcoma is possible. I shall therefore rest with the diagnoses of simple anemia due to hemorrhage from the stomach, malignant tumor of the stomach and old rheumatoid arthritis.

DR. RICHARD SCHATZKI: The remark in the record about the x-ray findings may have given Dr. Jacobson the wrong impression about the actual appearance of the stomach. This patient's stomach at times looked perfectly normal, and, as this film demonstrates, at other times we thought that there was definite thickening of the mucosa in the region of the angle of the stomach. In this area of thickening there was something that was suggestive of ulcer. I was the examiner, and I was not too satisfied because the thickening disappeared easily — at times it was present, and at others it was not. I finally said that it was suggestive of ulcer. We thought that there was definitely something wrong with the stomach, and it was the X-ray Department that asked Dr. Benedict to do the gastroscopy.

DR. EDWARD B. BENEDICT: The edema of the submucosa and the hemorrhage certainly meant acute gastritis to me, and the verrucous appearance of the mucosa meant chronic gastritis. The fact that the rugae were large and did not disappear with air inflation as they usually do suggested the possibility of lymphoma in a person as young as this — a diffuse process. I considered lymphoma

*Schiodt, E. Observations on blood regeneration in man. I. Rise in erythrocytes in patients with hematemesis or melena from peptic ulcer. *Am. J. M. Sc.* 193:313-327, 1937.

the likeliest form of tumor, if it was a tumor. The preoperative diagnosis of lymphoma is almost impossible to make either by x-ray study or gastroscopy. I have made it correctly in one case in which the pathologist on the gross appearance did not believe that lymphoma was present, but the microscopic sections proved it to be lymphoma. I was probably lucky because I have been wrong since then.

DR. TRACY B. MALLORY: Dr. Ropes, have you any comment?

DR. MARIAN W. ROPES: We followed this patient for a good many years, and so far as the arthritis was concerned she was doing well. The anemia came on rapidly over a period of several months. We are still entirely unable to explain the anemia. She apparently had a spontaneous remission before treatment was started and the blood picture returned to a fairly normal level. We al decided that there was probably no intrinsic disease in the stomach. The guaiac tests on the stools were only slightly positive at the time when iron therapy was being given. Whether there was major bleeding from the stomach was a question; we thought that there was none.

A PHYSICIAN: I should like to ask Dr. Benedict if he would expect to visualize the crater-like fleck by gastroscopy if the lesion was on the posterior wall of the stomach.

DR. BENEDICT: I should, but I did not.

CLINICAL DIAGNOSIS

Malignant lymphoma of stomach?

DR. JACOBSON'S DIAGNOSES

Simple anemia due to gastric bleeding.
Malignant tumor of stomach.
Rheumatoid arthritis.

ANATOMICAL DIAGNOSIS

Chronic pancreatitis, with extension to wall of stomach.

PATHOLOGICAL DISCUSSION

DR. MALLORY: I do not know whether the operative findings or the pathological report is going to be entirely satisfying in this case. There was no tumor in the stomach. When the patient was explored the posterior wall and lesser curvature of the stomach seemed thick and densely adherent to the pancreas. Frozen section at the time of operation showed no tumor, and that fact was later confirmed by the final sections. There was a severe, extensive chronic pancreatitis, with marked adhesions to the stomach wall, but I was unable to make a diagnosis of gastritis. The stomach of any adult person, of course, always shows histologically some degree of inflammation. It has often been spoken of as physiologic gastritis. If this later becomes exaggerated in character, such as that frequently seen in association with ulcer, a picture results that the gastroscopist describes as hypertrophic gastritis. In this case I do not believe that the inflammatory process was beyond the normal limits. Also, there was no suggestion of atrophic gastritis; the glands were well formed and contained normal numbers of chief and parietal cells. From the microscopic appearance I see no reason why the stomach was not secreting normal gastric juice.

DR. BENEDICT: Some years ago Dr. Mallory and I* checked up the histologic and gastroscopic findings in resected stomachs and found that we agreed fairly well regarding the presence of gastritis and the type. I think that this case, because of the severe pancreatitis, could throw off the gastroscopist and the roentgenologist. Do you agree, Dr. Schatzki?

DR. SCHATZKI: Yes.

DR. MALLORY: I think that the deformity in the stomach was due to marked thickening of the external layers of the wall secondary to the adhesions of the pancreas.

DR. JACOBSON: Is it possible to explain both the x-ray picture and the gastroscopic picture by edema?

DR. MALLORY: It is difficult for us to judge edema in a resected specimen. It could, I am sure, disappear under some conditions. It could be produced by the surgeon's clamps on the stomach at operation. That is an unreliable observation on our part.

DR. BENEDICT: There was an interval of two or three weeks between operation and gastroscopy. Do you regard that as important?

DR. MALLORY: Considerable grades of acute gastritis can disappear rapidly. That is always a possibility.

DR. JACOBSON: What do you think was the cause of the anemia?

DR. MALLORY: I have no better guess than anyone else.

DR. JACOBSON: I suggest that this patient be followed from the point of view of later development of pernicious anemia or atrophic gastritis. Achylia at the age of twenty-eight is not frequent and should be looked on as a basis for pernicious anemia, benign polyp or carcinoma.

DR. BENEDICT: Do you think that it is the achylia gastrica or the gastric atrophy that leads to carcinoma? It is my belief that gastric atrophy leads to carcinoma — that gastric carcinoma does not develop in a healthy mucosa.

DR. JACOBSON: This mucosa may not be healthy five years from now. Most people who eventually develop pernicious anemia are probably born with achylia gastrica.

DR. BENEDICT: And atrophic gastric mucosa?

DR. JACOBSON: I do not know.

DR. BENEDICT: What about that, Dr. Mallory?

DR. MALLORY: I do not know how far back in youth one could see it. We do not often see atrophic gastritis in young persons.

*Benedict, E. B., and Mallory, T. B. Correlation of gastroscopic and pathological findings in gastritis. *Surg., Gynec. & Obst.* 76:129-135, 1943.

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ARTIFICIAL SUNLIGHT TREATMENT IN INDUSTRY

Ever since Finsen in Denmark and Rollier in Switzerland popularized the use of natural and artificial sunlight in the treatment of nonpulmonary tuberculosis, tremendous interest in the possible general helpful effects of this form of treatment has been manifested both by the medical profession and by the general public. This interest increased still more after it was demonstrated that exposure of the skin to ultraviolet rays was effective in preventing infantile rickets and when this effect was shown to be due to the conversion of the ergosterol present in the skin into vitamin D by the irradiation.

Ultraviolet irradiation has been widely used in the treatment of certain diseases, but it has also been recommended on less secure grounds both as a general "tonic" and as a means of preventing and correcting minor conditions of ill health. The increased use of artificial light in work places and the black-out conditions prevailing in many localities during the war years encouraged the prophylactic use of sources of artificial sunlight in factories, mines and offices. There is no convincing evidence, however, of the value of such uses for ultraviolet irradiation. It has been claimed that a few minutes' exposure to the rays of a quartz mercury-arc lamp each week is equivalent to some hours of natural sun bathing. From this has arisen the far more reaching claim that a course of such exposures reduces the amount of absenteeism due to accidents, common colds and general ill health.

It is now a simple matter to administer ultraviolet treatment to large numbers of workers with a relatively small loss of working time, and it would be quite easy to apply such therapy to large proportions of the employees in industrial and other occupations were it actually proved to have the good general effects attributed to it. In view of the conflicting nature of the previous evidence on the subject, the Industrial Health Research Board of the Medical Research Council of Great Britain considered it highly desirable to sponsor a well controlled and relatively large-scale inquiry into this important subject. The study was carried out by Dr. Dora Colebrook, and her excellent report was recently published.*

The effects of ultraviolet irradiation on the health of clerical and industrial workers in three separate communities were investigated in Great Britain during the winter of 1944–1945. The criteria used were as follows: the amount of absenteeism due to sickness in all the groups, the duration of colds among clerical and factory workers and the absenteeism due to injuries and other causes among miners. In each community the group of persons receiving the full range of rays from mercury-arc lamps was compared with two control groups—a treated group irradiated with lamps of the same type but from which the shorter ultraviolet rays were cut off and an untreated group. The treated

*Colebrook, D. *Artificial Sunlight Treatment in Industry: A report of results of three trials—in an office, a factory and a coal mine.* Industrial Health Research Board Report, No. 89. 64 pp. London: His Majesty's Stationery Office, 1946.

controls shared with the fully treated group the experience of attendance at the clinic and of irradiation with the longer ultraviolet rays, for which no therapeutic effects have been claimed. Half the treated controls received in addition a maintenance dose of vitamin D.

Volunteers were allocated to the treated groups by random sampling. A comparison of the records of the groups treated with complete and long ultraviolet rays showed that the persons in the former did not differ significantly from those in the latter in respect to sickness and to the reported duration of colds. There was no evidence of a vitamin D deficiency in either group. Some subjects stated that their health had been better during the period of attendance in the clinic, but there was no evidence that this was due to the short ultraviolet rays, since the numbers were about equally distributed in the two treated groups.

The comparisons between the treated and untreated groups were not quite so clean cut, probably because those in the latter could not be selected at random. The study showed that the treated group of clerical and factory workers fared no better than the untreated group in respect to absenteeism due to sickness. In respect to colds, there was actually a significant advantage to the untreated subjects. Both groups of treated miners, those receiving and those not receiving the shorter ultraviolet rays, had a significant advantage over the untreated controls in respect to sickness and total absences. Evidence, however, was given to show that the previous health of this untreated group had not been so good as that of the treated group in the previous year.

On the whole the results of the study may be interpreted as indicating that the general application of ultraviolet irradiation has none of the "tonic" effects that have been attributed to it. From this point of view, the use of artificial sunlight may be considered only as a sort of modern version of sun worship.

Dr. Colebrook's report, in addition to being a clear and careful presentation of this particular study, can also serve as a model for large-scale controlled therapeutic experiments. The methods employed in the study are presented in great detail and are critically analyzed, as are the data and the results. It should be borne in mind, however, that this study was not concerned directly with the bactericidal action of ultraviolet light. That property, which requires ultraviolet rays of different wave lengths than those used for antirachitic irradiation, has been used in attempts to eliminate cross infections and bacterial contamination of surgical wounds. An evaluation of such uses for ultraviolet irradiation requires entirely different technics.

NATIONAL EMERGENCY MEDICAL CARE

QUESTIONNAIRES are now being sent by the Committee on National Emergency Service of the American Medical Association to approximately 5000 physicians, selected at random, who remained in civilian practice during the war. Following a study of the replies that are received, it is expected that sound conclusions can be drawn regarding the medical care that the civilian population received during that period. Furthermore, it is hoped that intelligent opinions concerning the inadequacies that arose and how they could have been avoided will be expressed.

In view of the recent rapid advances in scientific warfare, as well as in scientific medicine, the House of Delegates of the American Medical Association, at its meeting in December, 1945, recognized that information concerning how the medical profession can best serve the military and civilian populations in the event of another national emergency must be made generally available, and the appointment of the Committee on Military Medical Service, whose name was eventually changed to the Committee on National Emergency Medical Service, was accordingly authorized. During December of last year questionnaires were forwarded to more than 50,000 former medical officers, requesting information regarding their experiences while in military service. The response was excellent, and these replies are now being analyzed and studied. The results of this study combined with those arising from an analysis of the replies to the present questionnaire should permit the drafting of recommendations that would be of inestimable value to the people of this country if another emergency should arise in the near future.

Since the present questionnaires are being sent to only a small percentage of the physicians who

remained in civilian practice, it is obvious that practically all of them must be answered if a broad representation of facts, experiences and opinions is to be obtained. Every physician who receives the questionnaire should fill it out promptly and return it immediately; whether or not he signs his name is optional.

MASSACHUSETTS MEDICAL SOCIETY

BUREAU OF CLINICAL INFORMATION

All secretaries of various medical groups, such as special societies and alumni associations, are requested to notify the Bureau of Clinical Information regarding scheduled meetings, annual dinners and so forth. If such data are on file, it is hoped that duplication of dates can be avoided.

DEATHS

CALDICOTT — Francis S. Caldicott, M.D., of Lowell, died January 17. He was in his fifty-eighth year.

Dr. Caldicott received his degree from Tufts College Medical School in 1913.

His widow survives.

KINGSLEY — Frederick Kingsley, M.D., of Chestnut Hill, died February 1. He was in his sixty-seventh year.

Dr. Kingsley received his degree from Queens University Faculty of Medicine, Kingston, Ontario, in 1905. He was a fellow of the American Medical Association.

His widow, two sons and a daughter survive.

NOBLE — Mary E. G. Noble, M.D., of Brookline, died February 16. She was in her seventy-fifth year.

Dr. Noble received her degree from Tufts College Medical School in 1902. She was psychiatrist at the Boston State Hospital for thirty-eight years, and was a member of the New England Society of Psychiatry and the Massachusetts Psychiatric Society.

Two nieces and a nephew survive.

PATCH — William T. Patch, M.D., of Roxbury, died February 7. He was in his eighty-sixth year.

Dr. Patch received his degree from New York University Medical College in 1890. He was a fellow of the American Medical Association.

RICHARDSON — Mark W. Richardson, M.D., of Newton Center, died February 12. He was in his eightieth year.

Dr. Richardson received his degree from Harvard Medical School in 1894. For a number of years he was a member of the former State Board of Health, and until his retirement several years ago he had served as medical director of the Equitable Life Insurance Company. He was a member of the Association of American Physicians and a fellow of the American Medical Association.

A son and three daughters survive.

ROSE — Wilfred A. Rose, M.D., of Lawrence, died September 24. He was in his forty-second year.

Dr. Rose received his degree from Tufts College Medical School in 1930.

His widow, a son and a daughter survive.

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Harvard Medical School, 1935.

CHASEN, MIGNON C., Boston State Hospital, Dorchester.
Royal University of Palermo, Italy, 1935. Sponsor: Walter E. Barton, Boston State Hospital, Dorchester.

CHASEN, WILLIAM H., 474 Canterbury Street, Roslindale.
University of Lausanne, 1937. Sponsor: John S. Thornton, 1890 Beacon Street, Brookline.

CREHAN, JOSEPH P., 16 Avalon Road, West Roxbury.
Boston University School of Medicine, 1943.

DAIELL, SAUL S., 19 Mount Vernon Street, West Roxbury.
Louisiana State University School of Medicine, 1941.

DAVIS, JEAN P., 28 Avon Road, Wellesley.
Yale University School of Medicine, 1943.

ELWYN, SIDNEY L., 783 Washington Street, Dorchester.
Middlesex University School of Medicine, 1941. Sponsor: George A. Small, 81 Walpole Street, Norwood.

FISHER, H. BERNARD, 14 York Street, Dorchester.
Tufts College Medical School, 1938.

FITZGERALD, JAMES A., 82 Perry Street, Brookline.
Harvard Medical School, 1943.

GARRIGUES, HENRY B., 47 Webster Street, Needham.
Harvard Medical School, 1937.

GILBERT, JOHN J., 241 Humboldt Avenue, Roxbury.
Middlesex University School of Medicine, 1936. Sponsor: Rubin Guralnick, 87 Maple Street, Roxbury.

GLICKMAN, ABRAHAM J., 11 Wilcock Street, Dorchester.
University of St. Vladimira Faculty of Medicine, Kiev, 1904. Sponsor: Myer Herman, 1071 Blue Hill Avenue, Dorchester.

GOLUB, LEON M., 90 Corbet Street, Dorchester.
Boston University School of Medicine, 1945.

GORE, MAX, 107 Blue Hill Avenue, Roxbury.
Midwest Medical College, 1937. Sponsor: Jacob Applebaum, 371 Commonwealth Avenue, Boston.

GUCCIONE, I. JOSEPH, 91 Belgrade Avenue, Roslindale.
Middlesex University School of Medicine, 1939. Sponsor: Timothy P. Lyons, Milton.

GUCKER, THOMAS, 100 High Street, Brookline.
University of Pennsylvania School of Medicine, 1941.

HASENBUSH, LESTER L., 690 Blue Hill Avenue, Dorchester.
Johns Hopkins University School of Medicine, 1938.

HEPBURN, JAMES P., 36 Governor's Road, Milton.
Tufts College Medical School, 1942.

KAGAN, SAMUEL, 1405 Beacon Street, Brookline.
Midwest Medical College, 1935. Sponsor: Arthur Berk, Brookline.

KARPATI, OSCAR, 3 Brewster Terrace, Brookline.
Royal Hungarian Elizabeth University, 1926. Sponsor: Isaac R. Jankelson, Jamaica Plain.

LEONARD, FIELD C., 16 Parkway Road, Brookline.
Harvard Medical School, 1940.

LYONS, MELVIN K., 86 Floyd Street, Dorchester.
Boston University School of Medicine, 1943.

MANN, HAROLD E., 591 Morton Street, Dorchester.
University of Pennsylvania School of Medicine, 1944.

MATZ, MYRON H., 30 Alpha Road, Dorchester.
University of Minnesota Medical School, 1939.

MERRICK, EDWARD M., 115 Blue Hills Parkway, Milton.
Middlesex University School of Medicine, 1941. Sponsor: John A. Seth, 1550 Blue Hill Avenue, Dorchester.

MILLER, HAROLD I., 1067A Blue Hill Avenue, Dorchester.
Boston University School of Medicine, 1941.

O'DAY, JOHN J., 278 Railroad Avenue, Norwood.
Tufts College Medical School, 1941.

POWERS, WILLIAM J., JR., 308 Massapoag Avenue, Sharon.
Tufts College Medical School, 1943.

PRICE, WILLIAM B., 62 Clifford Street, Roxbury.
Meharry Medical College, 1939.

ROSSMAN, BENNY, 1382 Beacon Street, Brookline.
University of Marburg, 1921. Sponsor: Carl Dahlen, 1620 Beacon Street, Brookline.

RUBEN, MAURICE R., 40 Hansborough Street, Dorchester.
Boston University School of Medicine, 1939.

STANLEY, EDITH D., 37 Garrison Road, Brookline.
Temple University School of Medicine, 1940.

STRAUSS, LOUIS, 483 Talbot Avenue, Dorchester.
Middlesex University School of Medicine, 1940. Sponsor: Hyman Morrison, Brookline.

SUNSHINE, SAMUEL, 487 Adams Street, Milton.
Middlesex University School of Medicine, 1941. Sponsor: Norman Welch, 644 Weld Street, West Roxbury.

WEISMAN, WILLIAM S., 48 Hazelton Street, Mattapan.
Middlesex University School of Medicine, 1933. Sponsor: John W. Spellman, Chestnut Hill.

Basil E. Barton, *Secretary*
10 Richwood Street, West Roxbury

NORFOLK SOUTH DISTRICT

BROUGHAM, MILTON F., 100 Havilend Street, Wollaston.
Harvard Medical School, 1940.

CONLAN, WILLIAM P., 111 South Franklin Street, Holbrook.
Middlesex University School of Medicine, 1933. Sponsor: Frank W. Crawford, 98 North Franklin Street, Holbrook.

EICHWALD, ERNST J., 77 Colonial Road, North Weymouth.
Albert-Ludwig University, Freiburg, Germany. Sponsor: James T. Cameron, 1400 Hancock Street, Quincy.

GARLAND, DONALD M., 105 Bickford Road, East Braintree.
Tufts College Medical School, 1942.

KNAPP, ALLEN H., 115 Monroe Road, Quincy.
Yale University School of Medicine, 1935.

KRASNER, GEORGE D., 26 Francis Avenue, Quincy.
Faculty of Medicine University of Basel, Switzerland, 1937. Sponsor: William S. Altman, 32 Spear Street, Quincy.

MCIVER, JOHN M., 27 Governor Long Road, Hingham.
Boston University School of Medicine, 1939.

SHEA, DANIEL F., 51 Verchild Street, Quincy.
Georgetown University School of Medicine, 1941.

SULLIVAN, ARTHUR P., 11 Grove Street, Quincy.
Tufts College Medical School, 1943.

THOMPSON, RUSSELL F., 359 North Main Street, Randolph.
Middlesex University School of Medicine, 1939. Sponsor: Harold R. Record, 408 Commercial Street, East Braintree.

Ebenezer K. Jenkins, *Secretary*
Norfolk County Hospital, South Braintree

PLYMOUTH DISTRICT

DEACON, WALTER E., 1 Depot Street, South Duxbury.
Tufts College Medical School, 1941.

GOODSTONE, SAMUEL B., 10 Brewster Street, Plymouth.
Harvard Medical School, 1924.

SARKISIAN, SARKIS A., 616 Main Street, Bridgewater.
Boston University School of Medicine, 1943.

WILDER, FRANCIS D., 275 Boylston Street, Brockton.
University of Lausanne, 1938. Sponsor: Ralph C. McLeod, Goddard Hospital, Brockton.

Ralph C. McLeod, *Secretary*
Goddard Hospital, Brockton

SUFFOLK DISTRICT

ALEXANDER, FRED, Massachusetts General Hospital, Boston.
University of Maryland School of Medicine, 1941.

CAHAN, ALVIN M., 214 Riverway, Boston.
Cornell University Medical College, 1940.

FELDMAN, JOSEPH D., 41 Park Drive, Boston.
Long Island College of Medicine, 1941.

GEISS, GEORGE W., 42 Grove Street, Boston.
Middlesex University School of Medicine, 1933. Sponsor: Winthrop Wetherbee, Jr., 24 School Street, Boston.

LATORELLA, JOHN D., 117 Bartlett Road, Winthrop.
Middlesex University School of Medicine, 1937. Sponsor: Pasquale Costanza, 238 Maverick Street, East Boston.

LIVINGSTONE, ROBERT G., 572 Huntington Avenue, Boston.
Harvard Medical School, 1942.

MIDDLEBROOK, GARDNER, 400 West 119th Street, New York City.
Harvard Medical School, 1944.

MILLER, JULIUS Y., 1318 Commonwealth Avenue, Allston.
Tufts College Medical School, 1938.

MURPHY, ROSEMARY A., 239 Commonwealth Avenue, Boston.
Boston University School of Medicine, 1942.

O'BRIEN, PAUL A., 156 Somerset Avenue, Winthrop.
Tufts College Medical School, 1943.

PANDOLFINO, JOSEPH E., 18 Winchester Street, Boston.
Tufts College Medical School, 1943.

RUZICKA, EDWIN R., 62 Crosby Road, Chestnut Hill.
University of Maryland School of Medicine, 1939.

SANBORN, EARL B., 711 West 171st Street, New York City.
Northwestern University Medical School, 1942.

SCIACCA, GUY F., 23 Unity Court, Boston.
Middlesex University School of Medicine, 1939. Sponsor: Gerardo M. Balboni, 78 Mt. Vernon Street, Boston.

SIEGEL, ROBERT, 489 Beach Street, Revere.
Laval University Faculty of Medicine, 1942.

STEVENSON, STUART S., 233 Beacon Street, Boston.
Yale University School of Medicine, 1939.

TUCKER, WALTER I., 629 Commonwealth Avenue, Boston.
Harvard Medical School, 1939.

WEINBERGER, JEROME L., 117 Bay State Road, Boston.
New York University College of Medicine, 1938.

WOLL, EPHRAIM, 107 Avenue Louis Pasteur, Boston.
Creighton University School of Medicine, 1942.

ZAMBELLA, JOSEPH, 36 Villa Avenue, Winthrop.
Kansas City University of Physicians and Surgeons, 1937. Sponsor: G. Lyman Gately, 624 Bennington Street, East Boston.

Robert L. Goodale, *Secretary*
330 Dartmouth Street, Boston

WORCESTER DISTRICT

ALTENHAUS, GEORGE, Rutland State Sanatorium, Rutland. University of Vienna Faculty of Medicine, 1924. Sponsor: Paul Dufault, Rutland State Sanatorium, Rutland.

BAKER, DONALD V., South Main Street, Uxbridge. Harvard Medical School, 1942.

BALDRY, GEORGE S., Rutland State Sanatorium, Rutland. University of Manitoba Faculty of Medicine, Canada.

BERRY, FRANCIS D., 84 High Street, Milford. Tufts College Medical School, 1944.

BROCHU, CHARLES E., 3 May Street, Webster. Georgetown University School of Medicine, 1937.

DEAN, MICHAEL A., Main Street, Millville. Tufts College Medical School, 1943.

DI CICCO, JOHN P., 242 Main Street, Webster. Middlesex University School of Medicine, 1941. Sponsor: Roger W. Schofield, 36 Pleasant Street, Worcester.

ITKIN, IRVING H., 48 Columbia Street, Worcester. Indiana University School of Medicine, 1939.

LAHEY, PHILIP J., 6 Chatham Place, Worcester. Tufts College Medical School, 1939.

MASTERSON, JAMES H., 745 Pleasant Street, Worcester. Tufts College Medical School, 1943.

METCALF, ROGER G., Meadowbrook Road, Southbridge. University of Rochester School of Medicine, 1940.

MORIARTY, DANIEL J., 66 Maywood Street, Worcester. University of Vermont College of Medicine, 1937.

ROSEN, ABRAHAM E., 72 Highland Street, Worcester. Tufts College Medical School, 1939.

SCANLON, JOSEPH C., 25 Catherine Street, Worcester. Boston University School of Medicine, 1944.

SHEEHAN, JOHN F., 25 Catherine Street, Worcester. Tufts College Medical School, 1938.

WOJCIECHOWSKI, ANTHONY A., 38 Crosby Street, Webster. Tufts College Medical School, 1942.

Julius J. Tegelberg, *Secretary*
390 Main Street, Worcester

WORCESTER NORTH DISTRICT

BAUTZE, FRANK A., 26 Forest Street, Baldwinsville. Harvard Medical School, 1942.

GROSSMAN, MYER J., 352 Crescent Street, Athol. Middlesex University School of Medicine, 1933. Sponsor: Donald B. Cheetham, 152 Exchange Street, Athol.

James G. Simmons, *Secretary*
30 Myrtle Avenue, Fitchburg

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

BLOOD GROUPING AND Rh TYPING OF PRENATAL BLOODS

For the present, the Massachusetts Department of Public Health has facilities for blood grouping and Rh testing of a limited number of prenatal bloods submitted by physicians.

Each specimen must be accompanied by the form entitled "Request for Prenatal Blood Grouping and Rh Typing" that is properly filled in. These forms, which include directions, may be secured from the Wassermann Laboratory, 240 Longwood Avenue, Boston 17. The specimen is submitted in the department's regular Wassermann outfit, and the blood-grouping, the Rh-typing and the prenatal Hinton test can be conveniently performed on the same specimen.

CONSULTATION CLINICS FOR CRIPPLED CHILDREN IN MASSACHUSETTS UNDER THE PROVISIONS OF THE SOCIAL SECURITY ACT

CLINIC	DATE	CLINIC CONSULTANT
Salem	March 3	Paul W. Hugenberger
Haverhill	March 5	William T. Green
Lowell	March 7	Albert H. Brewster
Brockton	March 13	George W. Van Gorder
Springfield	March 18	Garry deN. Hough, Jr.
Pittsfield	March 19	Frank A. Slowick
Fall River	March 24	David S. Grice
Hyannis	March 27	Paul L. Norton

Physicians referring new patients to clinics should get in touch with the district health officer to make appointments.

BOOK REVIEWS

Public Health the American Way. By H. B. Anderson. 8°, cloth, 238 pp. New York: Citizens Medical Reference Bureau, Incorporated, 1945. $2.50.

This volume is a compilation of short abstracts interspersed with statements by the author, who is secretary-treasurer of the Citizens Medical Reference Bureau, Incorporated. The purpose of this bureau is stated in its certificate of incorporation: "To preserve, establish, maintain and safeguard through publicity and other lawful means, the right of adults or, in the case of minors, the right of parents or guardians to determine the form or manner of treatment or care to be prescribed or applied for the cure or prevention of disease."

Although some of the quotations in the book are of recent origin and from prominent physicians, others are not. The following are excerpts:

> . . . for all practical purposes smallpox of a virulent character in the United States is an imaginary disease.
>
> . . . the presence or absence of classical or virulent smallpox bears no relation whatever to the vaccination laws of any country but it does bear a direct relationship to the progress of the respective countries in the improvement of sanitary and general living conditions.
>
> Many persons have learned how to live so that to them it is natural to be healthy without the aid of medical products of any kind and they want to be left alone so they can continue to be naturally healthy.

It is doubtful whether this book will be of interest to many members of the medical profession.

The Principles and Practice of Tropical Medicine. By L. Everard Napier. 8°, cloth, 917 pp., with 195 illustrations and 32 tables. New York: The Macmillan Company, 1946. $11.00.

Napier's approach to tropical medicine is distinctive. The style is readable and suggests at times the informal clinical lecture. In general, the material is presented systematically, simply and clearly.

The chapters dealing with the diseases of India, which the author knows well, are excellent. This is notably true of the chapter on kala-azar. The importance of malaria has been emphasized, as it should be, by the devotion of many pages to this subject.

Unfortunately, some of the helminthic diseases have been less well handled, and some old errors have been perpetuated. For example, the map showing the distribution of bancroftian filariasis indicates that the disease exists in parts of the Belgian Congo in which *Wuchereria bancrofti* is not indigenous. The names *Trichuris trichiura* and *Trichocephalus trichiura* are used interchangeably to designate the former. Iceland is listed first among the important foci of hydatid disease, whereas the disease is practically nonexistent there today. Its occurrence in England is not mentioned. The sections concerned with various kinds of tapeworms are separated from each other by chapters that deal with quite different kinds of helminthic diseases.

The chapter on climate and disease is interesting. The author's views on house construction and on air conditioning in the tropics are informative.

Some of the more important methods of laboratory diagnosis of tropical diseases are well described.

Many of the illustrations and diagrams are good, but a few might advantageously be improved or even omitted.

Skin Diseases, Nutrition and Metabolism. By Erich Urbach, M.D. With the collaboration of Edward B. LeWinn, M.D. 8°, cloth, 634 pp., with 266 illustrations and 112 tables. New York: Grune and Stratton, 1946. $10.00.

English-speaking dermatologists owe the author a debt of gratitude for this stupendous encyclopedia of thirteen hundred references on the various aspects of nutrition and cutaneous metabolism. The book is divided into four parts. Part I deals with the influence of nutrition on the physiology of the skin. Part II describes the nutritional causes of dermatoses. The influence of diseases of the gastrointestinal tract, liver and pancreas on the skin is the subject matter of Part III. In Part IV the nutritional therapy of skin diseases is reviewed. There are over one hundred tables, in which are included many useful diets. The two hundred and sixty-six illustrations are excellent.

The compilation of the information so essential to the investigator and dermatologist required limitless patience and energy. This, however, is a fact familiar to those who have known the author for the past twenty years and who have read his writings in numerous journals. The volume should be a stimulus for further research in this somewhat neglected field of cutaneous medicine. The average dermatologist has little faith in the value of dietary therapy. Perhaps this is due to his lack of knowledge, or to disappointment in his results after following the enthusiastic recommendations of Dr. Urbach and other workers in this field.

All dermatologists and students of nutrition should have this book in their library, for they can use it with discrimination. Because of its many theoretical contraindications, however, the reviewer hesitates to recommend it to the student and general practitioner, unless he has had excellent basic training in biochemistry.

A History of Medicine. By Douglas Guthrie, M.D., F.R.C.S. (Edin.), F.R.S.E. With an introduction by Samuel C. Harvey, M.D. 8°, cloth, 448 pp., with 72 plates. Philadelphia: J. B. Lippincott Company, 1946. $6.00.

This book appeared in England and on this side of the Atlantic at about the same time. In England it was put out by Thomas Nelson and Sons, whereas in the United States its publisher bears a different name. Yet, so far as can be ascertained, the two imprints are identical in pagination, illustrations and content.

The *British Medical Journal*, the *Bulletin of the History of Medicine*, the *Journal of the Association of American Medical Colleges* and the *Lancet* have reviewed this work. All but the *Bulletin of the History of Medicine* gave high praise to what the author had attempted and his manner of work; the review in the *Bulletin* is more critical and seems a trifle captious.

As a matter of fact, this lively history of medicine from its earliest days to the present is readable, informative and entertaining. Although a professional historian can easily pick flaws in a work of this character, the ordinary reader will have little cause for complaint. The material is presented in an orderly way and is well indexed; the typography is good, the illustrations are apt, the literary style is admirable, and at the end of each chapter is listed a selection of material for further reading on the topic under discussion, so that earnest amateurs are well guided.

The book was placed on the shelf in one of the medical-school libraries along with several other books of current interest. The reaction of the students was unusual: a great many looked through the volume and glanced at the pictures; several sat down to read the book seriously, so that it was difficult to keep it in place; and a few wished to know how to obtain copies for themselves, saying that it seemed exactly the type of medical-history text for which they had been seeking. Such an opinion from students is about as complimentary as possible. On the whole, a taste for medical history develops late, and thus any well written book on the subject that attracts medical students commands respect. It may prove to be the cornerstone to many young people for years of pleasure.

The Osseous System: A handbook of roentgen diagnosis. By Vincent W. Archer, M.D. 8°, cloth, 320 pp., with 148 plates. Chicago: The Year Book Publishers, Incorporated, 1945. $5.50.

This handbook of roentgenologic diagnosis is a mine of useful information. It describes and shows in excellent illustrations the usual lesions found in the bones of both children and adults. The author states in his preface that the book is written for the occasional roentgenographer. In this, he achieves his purpose admirably. The book is well arranged; one does not need to search the index. The descriptions are concise and clear, and the reproductions of the x-ray films are almost without fault. Here is a good book both for the student and the experienced roentgenologist. It can be heartily recommended as the best handbook in its field.

BOOKS RECEIVED

The receipt of the following books is acknowledged, and this listing must be regarded as a sufficient return for the courtesy of the sender. Books that appear to be of particular interest will be reviewed as space permits. Additional information in regard to all listed books will be gladly furnished on request.

Synopsis of Gynecology. Based on the textbook, *Diseases of Women*, by Harry S. Crossen, M.D., consulting gynecologist, Barnes, St. Louis Maternity and St. Luke's hospitals, and Robert H. Crossen, M.D., assistant professor of clinical gynecology and obstetrics, Washington University School of Medicine, assistant gynecologist and obstetrician, Barnes and St. Louis Maternity hospitals, and gynecologist, St. Luke's and DePaul hospitals. Third edition. 12°, cloth, 253 pp., with 132 illustrations. St. Louis: C. V. Mosby Company, 1946. $3.00.

This third edition of a standard manual has been revised to date, and a new short chapter on medicolegal problems has been added, as well as many new illustrations.

The 1945 Year Book of Industrial and Orthopedic Surgery. Edited by Charles F. Painter, M.D., orthopedic surgeon, Massachusetts Women's and Beth Israel hospitals, Boston. 12°, cloth, 432 pp. Chicago: The Year Book Publishers, 1946. $3.00.

This latest edition of a standard yearbook has expanded to some extent the amount of space allotted to industrial medicine and surgery. This volume should prove of value to all persons interested in orthopedic surgery and industrial medicine.

Transactions of the American Gynecological Society. Vol. 68, for the year 1944. Edited by Howard C. Taylor, Jr., M.D. 8°, cloth, 324 pp. St. Louis: C. V. Mosby Company, 1945.

This volume contains the various papers read at the annual meeting of the American Gynecological Society, held in June, 1944, in Hersey, Pennsylvania.

Virus as Organism: Evolutionary and ecological aspects of some human virus diseases. By Frank M. Burnet, M.D., F.R.S., director, Walter and Eliza Hall Institute of Research in Pathology and Medicine, Melbourne, Australia. Harvard University Monograph in Medicine and Public Health, No. 8. 8°, cloth, 134 pp. Cambridge: Harvard University Press, 1945. $2.00.

This monograph is an expansion of the Dunham Lectures given at Harvard University in 1944. The author discusses some of the more important diseases of man from a consistently biologic point of view. Dr. Burnet's basic interpretation of virus disease is that viruses of micro-organisms have evolved by parasitic degeneration from larger micro-organisms, many of them in all probability from bacteria. The viruses survive by biologic reproduction, and the virus species, like any other living species, has found a way of indefinite survival. Dr. Burnet concludes that there is no escape from the pragmatic necessity of regarding viruses as living organisms reproducing their kind and subject to the same imperative of continued survival in a changing environment as other organisms. The first chapters consider the reproduction, variation and survival, evolution and change in virus disease, and the reaction of the host to virus infection. Following this there is a discussion of herpes simplex, poliomyelitis, psittacosis, smallpox, alastrim, vaccinia, yellow fever and influenza. A selected bibliography is appended to the text. This monograph, as well as all the other Harvard medical monographs, should be in all medical and public-health selections.

A Future for Preventive Medicine. By Edward J. Stieglitz, M.S., M.D. 8°, cloth, 77 pp. Studies of the New York Academy of Medicine Committee on Medicine and the Changing Order. New York: The Commonwealth Fund, 1945. $1.00.

Dr. Stieglitz presents the argument that the full achievement of preventive medicine requires the co-operation of the physician, the individual patient and the collective public. He points out that there are still many unexplored fields and urges more research in public health and medicine, particularly with reference to the health problems of middle and old age, better medical education and better public instruction. He believes that the conception of preventive medicine should be broad in scope. He divides his text into three parts: definitions pertaining to preventive medicine, including a classification of preventive activities; health over the last forty years, comprising a statistical study of morbidity and discussion of major present health hazards; and a program for preventive medicine, including its relation to environment, research and education and to the individual. A selected bibliography is appended to the text. This monograph should prove of value to all interested in public health and should be in all medical libraries.

NOTICES

JOSEPH H. PRATT DIAGNOSTIC HOSPITAL

Bennet Street, Boston
Lecture Hall, 9–10 a.m.

MEDICAL CONFERENCE PROGRAM

Friday, March 7 — Cancer of the Stomach, 1937–1947. Dr. Robert M. Kark.

Wednesday, March 12 — Clinicopathological Conference. Drs. Robert P. McCombs and H. E. MacMahon.

Friday, March 14 — Carcinoma of the Cecum. Dr. Donald T. Chamberlin.

Wednesday, March 19 — Pediatric Clinicopathological Conference. Drs. James M. Baty and H. E. MacMahon.

Friday, March 21 — Radioactive Iodine in Hyperthyroidism. Dr. Earle M. Chapman.

Wednesday, March 26 — The History of the Concept of Functional Nervous Disease. Dr. A. Warren Stearns.

Friday, March 28 — The Effect of Carotid Sinus Stimulation on Anginal Pain, and Other Considerations. Dr. Samuel Levine.

On Tuesday and Thursday mornings, Dr. S. J. Thannhauser will give medical clinics on hospital cases. On Saturday mornings, clinics will be given by Dr. William Dameshek. Medical rounds are conducted each weekday by members of the staff from 12:00 m. to 1:00 p.m. in the Lecture Hall.

All exercises are open to the medical profession.

TUFTS MEDICAL ALUMNI ASSOCIATION

The annual dinner meeting of the Tufts Medical Alumni Association will be held at 6:30 p.m. on Wednesday, March 26, at the Copley-Plaza Hotel, Boston. The guest speaker will be Thomas A. Hendricks, secretary of the Council on Medical Service of the American Medical Association, who will speak on the topic "Public Relations, Economics and the Doctor." President Leonard Carmichael of Tufts College will give a progress report. Dr. A. K. Paine, president of the Alumni Association, will speak on alumni affairs. Dr. John T. Batal, representing the twenty-five-year class, will speak on the subject "Time Marches On." Dr. Lewis B. Hayden, of Livermore Falls, Maine, will represent the fifty-year class. Dr. Dwight O'Hara will speak as dean of the Medical School and as president of the Massachusetts Medical Society. More than six hundred medical alumni are expected to attend this event. Dr. John J. Todd will preside.

AMERICAN COLLEGE OF SURGEONS

The fourth of a series of seven sectional meetings of the American College of Surgeons will be held in Providence on March 28 and 29, with headquarters at the Providence-Biltmore Hotel. Rhode Island and the surrounding states will participate. The medical profession at large, medical students and hospital personnel are invited to join with the fellows of the College in the meeting, which will be addressed by nationally prominent visiting and local speakers.

POSTGRADUATE INSTITUTE

The Eleventh Annual Postgraduate Institute of the Philadelphia County Medical Society will be held on the Roof Garden of the Bellevue-Stratford Hotel in Philadelphia on April 15, 16, 17 and 18. The theme of the meeting will be symposiums on medical progress. Among the subjects to be covered are thyroid disease, diabetes, vitamins and hormones, intestinal disorders, kidney pathology, peripheral vascular diseases, antibiotics, hypertension, diseases of the lung, neuropsychiatry, diseases of the stomach and duodenum, allergy, skin disorders and otolaryngologic diseases. There will also be two evening meetings at the building of the Philadelphia County Medical Society on the subjects of the disorders of childhood and infancy and of obstetric and gynecologic problems. There will be a complete array of technical exhibits, as well as a number of interesting scientific exhibits.

The registration fee for the entire course is $5.00 for nonmembers of the society. Out-of-town physicians planning to attend the meeting are urged to make their hotel reservations immediately. Further information may be obtained from Gilson C. Engel, M.D., Director, 301 South 21st Street, Philadelphia 3.

BOSTON CITY HOSPITAL HOUSE OFFICERS' ASSOCIATION

The March 25 lecture of the Tuesday evening lecture series of the House Officers' Association of the Boston City Hospital will be held in the new Cheever Amphitheater, Dowling Building, at 7:00. Dr. Cornelius P. Rhoads, director of the Memorial Hospital, New York City, will speak on the subject "The Metabolic Aspects of Cancer."

SOCIETY MEETINGS AND CONFERENCES

CALENDAR OF BOSTON DISTRICT FOR THE WEEK BEGINNING THURSDAY, MARCH 13

FRIDAY, MARCH 14

*9:00–10:00 a.m. Carcinoma of the Cecum. Dr. Donald T. Chamberlin. Joseph H. Pratt Diagnostic Hospital.

*10:00 a.m.–12:00 m. Medical Staff Rounds. Peter Bent Brigham Hospital.

12:00 m.–1:00 p.m. Clinicopathological Conference (Boston Floating Hospital). Joseph H. Pratt Diagnostic Hospital.

MONDAY, MARCH 17

*12:15–1:15 p.m. Clinicopathological Conference. Peter Bent Brigham Hospital.

TUESDAY, MARCH 18

12:00 m.–1:00 p.m. Dermatological Service, Grand Rounds. Amphitheater, Dowling Building, Boston City Hospital.

*12:15–1:15 p.m. Clinicoroentgenological Conference. Peter Bent Brigham Hospital.

WEDNESDAY, MARCH 19

*9:00–10:00 a.m. Pediatric Clinicopathological Conference. Drs. James M. Baty and H. E. MacMahon. Joseph H. Pratt Diagnostic Hospital.

*11:00 a.m.–12:00 m. Medical Clinic. Amphitheater, Children's Hospital.

*12:00 m Clinicopathological Conference. (Children's Hospital.) Amphitheater, Peter Bent Brigham Hospital.

*2:00–3:00 p.m. Combined Clinic by the Medical, Surgical and Orthopedic Services. Amphitheater, Children's Hospital.

*Open to the medical profession.

(*Notices continued on page xvii*)

NOTICES (*Continued from page 382*)

October 11-May 14. Metropolitan State Hospital. **Page 398, issue of September 12.**

March 7-28. Medical Conference Program. Joseph H. Pratt Diagnostic Hospital. **Page 382.**

March 11. Harvard Medical Society. Amphitheater, Peter Bent Brigham Hospital. 8:00 p.m.

March 13. Cornell Medical Alumni Day. **Page 156, issue of January 23.**

March 13. American Chemical Society. **Page 304, issue of February 20.**

March 13. What We Have Learned from the Study Through the United States of Child Health Service. Dr. Warren R. Sisson. Pentucket Association of Physicians. 8:30 p.m. Haverhill.

March 20. Food and Health Conference. **Page 340, issue of February 27.**

March 25. Boston City Hospital House Officers' Association. **Page 382.**

March 26. Tufts Medical Alumni Association. **Page 382.**

March 27. Winthrop Community Hospital. **Page 340, issue of February 27.**

March 28 and 29. American College of Surgeons. **Page 382.**

April 15-18. Postgraduate Institute. **Page 382.**

April 28-May 2. American College of Physicians. **Page 206, issue of August 8.**

May 20-22. Massachusetts Medical Society. Annual meeting. Hotel Statler, Boston.

May 20-22. Massachusetts Physicians' Art Association. **Page 340, issue of February 27.**

June 7 and 8. American Society for the Study of Sterility. **Page 304, issue of February 20.**

June 9-13. American Medical Association. **Page 698, issue of November 7.**

June 16-18. New England Health Institute. **Page 340, issue of February 27.**

June 30-July 3. American Urological Association. Hotel Statler Buffalo.

September 2-7. International Cancer Research Congress. **Page 340, issue of February 27.**

September 8-12. Third American Congress on Obstetrics and Gynecology. **Page 340, issue of February 27.**

District Medical Society

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*Frazer, J. G.: The Golden Bough, vol. 1, New York, Macmillan & Co., 1923

It is ironical that the practice of attempting to cure rickets by holding the child in the cleft of an ash tree was associated with the rising of the sun, the light of which we now know is in itself one of Nature's specifics.

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